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THE SCOTTISH GEOGRAPHICAL MAGAZINE

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Branches of the Society have been established in Glasgow, Dundee, and Aberdeen, where periodical Meetings are held.

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THE SCOTTISH GEOGRAPHICAL MAGAZINE.

ACROSS THE WESTRALIAN DESERT.

By Alexander Macdonald.

The Australian interior presents no alluring prospects to the explorer. The vast sand plains with their scant vegetation of dwarfed eucalypti, saltbush, and spinifex, do not inspire enthusiasm. A deadly stillness fills the quivering air, broken only by the harsh croak of the carrion crow or the weird double note of the mopoke. Here surely is an environment well fitted to unnerve even the strongest soul—a grim, silent ghost land which has claimed many a victim to the great cause of knowledge.

Since Colonel Warburton's magnificent journey across the Westralian desert many explorers have ventured to lessen the gloom that overshadows the vast "Never Never" country as a pall; and their labours have not been in vain. Knowledge has been gained, though in some cases at painful cost, and we are now aware that Interior Australia contains no flowing streams or fertile plains, as had at first been supposed. As to its mineral resources we as yet know very little, but rarely have auriferous indications been noted beyond the 123rd degree of longitude. Most explorers, however, being essentially in pursuit of geographical information, have little opportunity of systematically testing the surface sands or of sinking proving shafts, so that it is not improbable that a second Coolgardie may yet be found in these wastes. Indeed, the old prospectors of the colony believe firmly in the existence of such an El Dorado, and many are the strange reports concerning the "Back" country's riches that reach outpost settlements in some unaccountable manner.

The Hon. D. W. Carnegie's early pioneering journeys opened up several new fields, and on his last brilliant expedition across the interior, he made careful study of all promising country passed through, but much

to his disappointment indications were seldom found, and the prospects obtained insignificant.[1]

The journey of which I write was but a fresh attempt to discover the elusive golden area, and though little success resulted from it, I am still sanguine that a vast auriferous field does exist in these unknown tracts.

My party arrived at Nannine from the south-east early in August 1899. We had set out on a prospecting tour three months previously, but having met with scant return for our labours, we were determined to try our luck in a more northerly latitude.

Our outfit, at the start, was carried by four horses and two camels, but the horses had proved utterly unable to endure the rigours of the long, dry stretches encountered, and we reached the outpost with the two camels only—"Beelzebub" and "Slavery."

After loading these wiry animals with a fresh supply of provisions, we headed north through the Peak Hill district, intending to make an eastward course from the vicinity of the upper Gascoyne channel.

The party consisted of four in all: Mr. James Macrae, an experienced bushman and miner, was my right-hand man; the others, familiarly named "Mac" and "Stewart," were two brawny Scotsmen, who had accompanied me on many previous journeys in different parts of the world. The earlier part of our travels was through country now comparatively well known, and it is not therefore necessary to make further mention of it here.

Peak Hill is a very picturesque mining camp with its "hotels" and stores, and two hundred inhabitants: it boasts also of a post office, for this mining district, though far removed from civilisation, has proved to be the richest field in all Western Australia, and its importance, judged from the gold output, certainly well deserved the facilities the Government has supplied for its further development. Situated as it is in a hollow and surrounded by very hilly country, the traveller is not aware of the nearness of this settlement till he finds himself looking down upon a well-laid-out township, with streets and cross streets all glistening in the sun, for everything is white from the calico tent to the "Miners' Arms Hotel," which are the two extremes of the residential area. Strangely enough, this remote camp does not receive its name, as might be supposed, from the hilly nature of its surroundings, but from

[1] Since this article was written, I have learned, with deep sorrow, that the Hon. David Wynford Carnegie died in Nigeria on November 27, 1900, from a wound inflicted by a poisoned arrow. His has been indeed a life of brilliant promise cut cruelly short. In the early days of Coolgardie, he pioneered the country east and north-east of the now well-known goldfields district, and opened up new fields; but it was his great achievement in 1896-97 that should make his name worthy an honoured place in the list of Western Australian explorers. He started out from Doyle's Well, a few miles NNW. of Menzies, and crossed over a thousand miles of absolutely unknown territory between it and Hall's Creek in the Kimberley division. After a short stay in the northern settlement he again faced the desert, and proceeding south, east of the 127th degree of longitude, he rounded Lake Macdonald in the far interior, and arrived back at Coolgardie after an eleven months' absence. It is not my place to expatiate on the magnitude of his work; that is plain to all who examine a recent map of the Colony. No truer-hearted man, no more generous-minded comrade ever lived.

a mere hillock that rises in the centre of the valley and is surmounted by an elaborate cross.

We made a short stay in this neighbourhood, studying its odd auriferous formations; and a brief note regarding them may not here be out of place.

Many are under the mistaken impression that the auriferous stone is taken from a true fissure vein which runs at length through an enormous body of dioritic schist. This is not the case; as a matter of fact the gold is found in a bed of cement, which also contains fragments of quartz in a ferruginous matrix. Really, therefore, the field is alluvial, yet of such ancient origin that the "wash" has nearly all the properties of reefing stone, and has to be treated as such. The depth of the deposit varies from fifty to ninety feet, and water has been struck at the 230-feet level.

Evidence of volcanic action is very noticeable, and huge holes of inverted cone shape in many places penetrate the cement beds and enter the strata beneath; these were probably the craters formed by extraordinary hydro-thermal action. Beneath the cement many leaders of auriferous quartz penetrate the dioritic country, and, winding upwards, occasionally outcrop on the cement surface, showing clearly that the date of volcanic disturbance must have been more recent than the formation of these channels. All around this district, however, gold in the more ordinary formations is abundant, chiefly occurring in iron-stone lodes and unhappily in conjunction with pyrites, sulphur, and galena, thus necessitating the Cyanide process for its proper treatment. It is impossible to prospect any distance from the settlement; the mountains are barren of vegetation, and afford neither timber for burning nor shade from the blistering sun. Water can only be obtained by "sinking," and even then is scarce enough, so there is little to allure the prospector.

On August 17th we reached the Gascoyne channel at a point lat. 25° 12′, long. 119° 7′. Here we decided to camp and make final preparations for our struggle with the desert—after we had sunk a shaft in the bed of the channel and obtained water for present needs and for storage in the great water-bags.

The country from this point was flat and strewn with ironstone pebbles and quartz fragments. Far towards the west a low-lying range of hills could be traced, and farther south Mount Beasley raised his gaunt head above the sweltering plain. Eastward an even stretch prevailed and shimmered in the intense light, like the placid waters of a boundless sea.

The water-bags held thirty gallons of the precious fluid, and with that we did not anticipate any shortage before reaching a fresh soak or claypan. Yet like many others we were bitterly mistaken in our confident beliefs. We struck camp on the 19th of August and made a course due east, and soon were increasing the distance between us and civilisation. My henchmen, "Mac" and "Stewart," made the camels their especial charge, so that for the most part Macrae and I walked ahead directing the course, and at nightfall we sought the hardest ground for camping space.

Five days after leaving the Gascoyne we encountered a change of country, hitherto the sand soil had been hard packed and did not interfere with our progress, but now the slightest wind blew the loosening surface gravel into our faces, and filled our ears and nostrils. We sank over the ankles at each step, and the camels slowed their already slow march to a mere crawl and staggered and floundered in the wavy masses.

Gradually the land surface took on the appearance of a great sand sea with billows rolling northwards. So far as the eye could reach, east or north, a series of gentle undulations rippled into the vast distance. I realised that we had reached the outer edge of the northern desert traversed from the east by Colonel Warburton, and more recently from the south by these intrepid explorers: Calvert, Wells, and Carnegie. We had found no water since leaving the Gascoyne bed, and certainly none promised on the parched expanse we were now entering upon. I had intended to cross the lower boundary of this dreary waste, but had clearly come too far north.

I altered the course to ESE., and we traversed the disheartening obstacles at a difficult angle; but the undulations became more general as we progressed, until they surrounded us in the form of seemingly endless furrows, about a hundred and fifty yards apart and from ten to fifteen feet in height. A sparse vegetation of spinifex found root in the hill crests, giving them a somewhat strange appearance; but for the most part the undulations were barren and cheerless, and their white gleaming sand formation caused our eyes to quiver and close, so trying was the light reflected from them. No life of any kind was observed; we seemed to be traversing the bed of an ocean whose waters had long since subsided.

A day's march, however, led us into improved country, so that slightly better progress was made, and our prospects of finding water were decidedly more encouraging. At noon on the 25th of the month we entered a belt of very scrubby country, and crashed through miniature forests of stunted eucalypti; but this state of affairs was not destined to last long, for we could see in the distance at a slightly higher altitude the open plain extending back into the horizon. At this point Macrae considered the indications very favourable for water, and we decided to make a temporary camp and search the district thoroughly. We were preparing to unload the camels when Stewart, who had gone a little way ahead, came rushing back in great excitement, and in a loud whisper reported, "Niggers!" Looking up I saw quite an assembly of stalwart blacks directly in our course and scarcely two hundred yards ahead. Some bushes partially hid them from our view, and they had evidently not yet observed us. They seemed well equipped with spears and waddies: probably they had been out on a hunting expedition, and if so it boded well for the resources of the surrounding country. While we hesitated, debating on our best plan of action, they noticed us and gave vent to a series of shrill yells, yet apparently were undecided whether to resent our presence or escape while they might. Then a shower of spears whizzed through the air, fell short, and buried their heads in the

sand at our feet; we were just out of range of these missiles luckily enough. My companions were not disposed to tolerate such tactics, and Mac discharged his gun loaded with small shot in the direction of the horde. They waited no longer, but made a wild rush into the densest part of the scrub, and were quickly lost to sight. We proceeded onwards warily; far in the distance the branches crackled and broke before the fleeing band. The scene of their stand was littered with broken scrub, and the dying embers of a fire smouldered in the centre of a clearing. All around shields, spears, and kylies lay scattered as they had been thrown when their owners took to flight, and most welcome was the discovery of a spring near by. It was half hidden by an outjutting boulder, and further screened from view by a heavy growth of very fibrous grass. In width it measured scarcely a yard, and the depth of the water was but a few inches. The entire capacity proved to be five gallons, and over an hour was required to refill. I took the bearings of this native well with care. It is situated in lat. 25° 10′ 7″, long. 120° 29′ 0″, in the midst of a belt of scrub which stretches for a considerable distance north and south. We blazed several of the larger trees in the vicinity, and marked them M. and M., '99.

We camped at this spot all night in order to allow the camels to absorb their fluid supply of twenty gallons each, and in the early morning we were again on the march. In less than half an hour we came into open country showing a minimum of scrub and quantities of spinifex, while the sand was hard and mixed with ironstone gravel.

Our course was gradually ascending, but so gentle was the rise that we did not notice it until, on looking back, the brushwood appeared far back in the hollow. The hills on our left faded from sight as we continued on our route, and no other landmark appeared to gladden our sight that night.

Many days passed without incident, and we kept up our monotonous average of fifteen miles in the twelve hours more through force of habit than by exercise of energy. The surface soil was of a hard gravelly nature, liberally strewn with the iron pebbles so abundant in more southern latitudes. Straggling growths of eucalypti but a few feet in height spread everywhere, and at their roots, reptiles and many unnameable pests seemed to abide; black snakes writhed across our path, centipedes squirmed over our boots and gaitered ankles, iguanas in myriads started before our approach, and flying things with hard scaly wings rose from the shadeless branches and dashed into our faces. Flies in dense black clouds assailed us, causing indescribable torture. The pestiferous sand insect was also in evidence, and all travellers know the excruciating agony caused by this ubiquitous and baleful form of life. Twice we located a soak containing a few gallons of very muddy solution, and our canvas bags were fortunately kept replenished as we progressed. For over a week we journeyed across this dreary wilderness, nor did we once observe a break in the horizon's even curve. The weather meanwhile was of sweltering description.

My logbook reads dully enough for these days; it is but a repetition of sand, more sand, and sand again. When we reached the 124th

degree of longitude, however, the country became more broken, and in places stood out in great blows of ironstone rock or diorite formations, which lent a somewhat inviting aspect from a prospector's point of view.

A dim haze towards the north-east gradually outlined into a well-defined mountain range as we advanced, and I had no difficulty in recognising it as the Hutton mountains of Wells's expedition. We were now nearing the line of that explorer's northward march, and I shifted our course so that we might intersect it at its junction with Ernest Giles's great westward track, where a good supply of water was charted, for our fluid store had almost given out, and we had already been four days without discovering any trace of moisture.

On September 27th we entered upon a stretch of salt-crusted country, evidently the bed of an ancient lake; it extended for five miles in a due easterly direction, and towards its latter extremity the surface was marshy and damp. When rain falls, I doubt not the whole expanse should be covered to a depth of several inches. A distinctly more mountainous country was now making itself evident; decaying sandstone rocks reared their heads above the gravel, and enormous dry gullies tore up the ground in all directions. Our progress was perceptibly slowed, and in a full day we succeeded in covering only twelve miles.

We were at this stage uncomfortably short of water, and had I not the most implicit faith in Wells's location, matters might have become serious. As it was, the camels had actually to be pulled over the ground by their nose ropes and assisted over the slightest obstacle by our combined efforts.

On September 29th we camped in lat. 24° 47′ 11″, long. 124° 7′ 29″, and our fare was the dryest that had yet fallen to our lot. The inevitable "tinned dog" is a sufficiently unpalatable foodstuff, even when washed down with copious fluid draughts. We made but a poor meal, for the water-bags contained only a few pints, and the dreary, parched nature of the land had a most depressing effect on all of us. We started early next morning, meaning to reach the native well if possible before dark; a perfect barrier of grim-looking hills showed up in the dim distance, and the surface soon appeared black with ironstone pebbles which covered the sand soil to a depth of several inches.

All day long we journeyed wearily, the sun beating upon us mercilessly the while. No more desolate tract of country could be imagined than that which lies in these latitudes. The motionless mulga and mallee shrubs, the glistening beady surface over which we dragged our feet, the quivering heat haze that so distorted our visions, and the deathlike silence—the awful silence of a tomb—all tended to mentally overwhelm. I do not wonder that so many explorers have given their lives to this miserable desert. The water difficulty is not the only danger to be reckoned with; the enervating influence of the silent bush-land is surely a most cruel enemy. A broken range of sandstone hills loomed clearly out of the haze early in the afternoon, directly in our track, and I again altered our course slightly in order to round

their southern extremity. They were a welcome landmark; they had already served to guide many explorers on their weary way.

Towards the south the sand wastes extended far as the eye could reach, but east and north many mouldering peaks interrupted the even sweep of the horizon. We found the well without difficulty; it was half filled with muddy water over which a thick green scum had gathered, and its capacity we proved to be nearly forty gallons. We soon had our camp fire burning in close proximity. A few evidences of aborigines were present in the shape of burnt-out smokes, charred logs, and several "wind breaks"; but we could see no blacks, though probably they had watched our approach and decamped in affright.

We had frequently tested the surface sands for auriferous prospects on our route eastward, but between longitude 121° and 123° not the slightest trace of the precious metal was observed.

Around this well the indications were not unfavourable, and after supper, Macrae and I erected the "dryblower" and analysed many promising-looking patches. A few colours were obtained, but nothing to give confidence to even the most unambitious gold-seeker. Rather disconsolately we decided to continue our march in a NE. direction, and three days later we started on our altered course. Twelve miles a day does not quickly reduce the distance over the vast tracts of country in the island continent, and day after day passed in dreary routine.

Three days after leaving the well we reached a succession of sand ridges rolling backwards in a NW. direction, but another day saw us again on hard gravelly soil, and the prolific eucalyptus appeared in less stunted growths. A wiry sort of grass found root amid the pebbles, and though each blade was fully a foot apart from its neighbour, the appearance from a distance was distinctly pleasing.

That evening we were fortunate enough to find a small soak containing traces of "damp," as one of my companions not inaptly termed the muddy solution. The cavity was fully three feet deep, and about the same measurement across its mouth; the supply, such as it was, being evidently the result of a rainfall that had taken place some months before, for no water was being gathered, and traces of evaporation were noticeable from near the surface downwards.

We managed to extract about three gallons of the chocolate-coloured fluid from the semi-solid mass, and we stored it in two small water-bags separate from our main supply, for we did not care to pollute the purer fluid by adding this grimy liquid to its content. After a good rainfall the soak should hold about ten gallons, and may be depended upon always to contain some liquid of more or less dense nature. Its position is lat. 21° 3′ 27″, long. 124° 15′ 2″, and it is situated in the midst of a very promising stretch of country. Its foundation is of a hard impervious limestone formation. There was no doubt we were now crossing a most fertile belt of land—for Westralia: at this point, where we camped for the night, the ground was quite firm and the grass grew in waving patches here and there, while all around wild-flowers of the various hues of the rainbow flourished abundantly.

We congratulated ourselves on having at last reached a Westralian

paradise, but our pleasure was short lived; next day we were again struggling through most antagonistic country with sand, spinifex, and saltbush meeting our view on all sides—a cheerless prospect, surely.

And so we continued on our journey, making a varying course in order to escape broken country or trace auriferous indications. We discovered many rock-holes containing the residues of a previous rainfall, and as we progressed northward we rarely travelled a day without locating a soak or claypan of some description.

Once, however, over forty miles of a dry stretch was encountered, and on it we nearly came to grief after diverging many times in vain endeavour to find water. The land in this district—under the 23rd degree of latitude, and east of the 124th degree of longitude—is very similar to the southern goldfields plains: a hard, sandy flat, on which mallee and mulga shrubs are dotted, relieved here and there by clumps of saltbush and jagged spinifex growths.

The logbook of an explorer in Western Australia does not usually provide exciting reading, and I give a week's extract of mine as showing the dreary routine of the life, and the nature of the land surface between the 23rd and 24th parallels.

"October 17th.—Position at noon, lat. 23° 6′, long. 124° 45′. Course NNE. Journey 14½ miles. Since leaving soak slightly better travelling country has been met. The sand is hard packed, and in places salt crusted. Vegetation is scarce; mulga brush only in evidence. Flies ravenous. Slavery's eyes both closed with their attacks. Low-lying range of hills visible to NW. Clear expanse ahead.

"October 18th.—Sand and ironstone gravel country. Frightfully arid. Passed a number of dry ravines exposing limestone formation. Crows visible this morning, and a flight of pelicans was observed flying high and heading due east. Stewart suffering from scurvy." (Position not noted.)

"October 19th.—Lat. 22° 45′, long. 124° 48′. Journey 12 miles. Course NNE. More broken country, strewn with rubble and huge ironstone boulders. Spinifex plentiful. No saltbush. Shallow claypan located this morning. Filled water-bags and watered camels. Slavery showing signs of exhaustion.

"October 20th.—Lat. 22° 40′, long. 124° 54′. Journey 14 miles. In camp; intend to remain two days to allow camels to recuperate. Native well located here containing good supply. Slightly salt country. More mallee scrub. Broken-looking sandhills appearing directly in course.

"October 21st.—In camp repairing tattered wardrobes and constructing nets to keep off the flies.

"October 22nd.—Noon. Made early start and progressing favourably. Crossing low hills showing decayed diorite formation. Numerous dry gullies. Timber in distance.

"October 23rd.—Lat. 22° 28′, long. 124° 56′. Journey 14 miles. Camped by shallow lagoon in midst of lime-trees. Sparse grass of wiry nature covers usual iron gravel formation. Better country: lagoon evidently source of ancient river. Huge dry gully traces from it northward. Run out of saccharine. All well."

On October 27th we reached the easterly limit of our journey. I had not expected to cross the 124th degree of longitude when I set out from Peak Hill, but I had always had the idea that auriferous country existed well within that boundary. The Hon. D. W. Carnegie had often advised me to prospect between the 122nd and 124th degrees of longitude and north of the 23rd parallel, but he was himself bitterly disappointed in the barren nature of the land encountered on his great expedition, as many others have also been. As I have already said, it is not usual for an explorer to devote much of his time to mineral investigations, and unfortunately there are few inducements offered to the prospector in the "Never Never" land. I have, however, to chronicle an event of some importance, namely, the finding of a mountain range, lat. 22° 2′ 0″, long. 125 1′ 0″, through which extends several well-defined leaders of gold-bearing strata. The sides of the mountain are deeply torn by chasms and dry creeks, and the alluvial sands are distinctly auriferous. The lode formation is soft and rotten to the touch, and the rock is therefore easily crushed. It is, as nearly as I could judge, a decomposed dioritic schist formation. Some very fair prospects were obtained through the simple medium of a dolly and gold-pan; the ore, however, is freely intermixed with pyrites, and its treatment would baffle the pioneer prospector's usually crude machinery.

Around this district we camped for several weeks, making various journeys the while to the east and north-east. Towards the South Australian boundary the land promised to be a considerable improvement on that we had grown accustomed to. The solid sand formation was present, but a light soil covered it to a depth of nearly four inches. Timber is also more abundant, and water may be obtained in the beds of many deep gullies by sinking. Around the mountain animal life is plentiful; great herds of kangaroos were frequently seen. Natives were also numerous, but only on one occasion did they approach near to us. All our attempts to conciliate them failed; they invariably fled at our advance. Mac captured two stalwart specimens one day after a lengthy chase, and though they were sullen at first, they quickly learned to appreciate the virtues of "tinned dog" and flour, with which their jailor frequently tempted them.

The Australian aboriginal's habits and customs are somewhat peculiar, and my knowledge of them—acquired from the various tribes with which I have come in contact—may not be too uninteresting to give here.

The Australian native is a most unattractive specimen of humanity; usually in the savage state the faces of the males are covered with hair so shaggy and unkempt as to present a very frightful appearance. The cranial formation is narrow and long, the cheek bones are prominent, and the forehead recedes from directly over the eyebrows, giving a very baboonlike aspect to the face. These features are evident throughout all the various tribes, yet in some respects the natives of the different divisions are unlike.

The northern tribes, for instance, differ from their southern brethren in so far as they are more warlike and of greater physical development.

The aboriginal of the interior usually combines the characteristics of both, but in less pronounced degree. The dwellers in the East Gascoyne territory use weapons similar to those carried by the mountainous tribes, but they are cruder in finish and by no means so deadly; their spears are wooden barbed, but the hostile northerner edges his offensive weapons with flint.

The natives of the north-west camp in the open, using no sort of covering whatever, while in the central districts the custom is to erect temporary windbreaks of branches and logs at each halting-place. Clothing is conspicuously absent with them all, a girdle of yarn usually forming their complete attire, though a "booki" or cloak made of kangaroo skins is sometimes worn.

Their ornaments consist of, perhaps, a tuft of emu feathers or the plumage of a parrot, fixed in the hair or tied round the arm, and a small piece of hard wood decorated with carving, or a fragment of bone inserted through the nose, is considered quite an elegant addition to the toilet. Like the Red Indians, they are given to smearing their faces with a kind of paint obtained from plants (Wulga).

Their religious ideas are of a very pronounced kind, and involve many ordeals of endurance and physical suffering. Curiously enough they are very elaborate in some of their funeral customs. On the occasion of a death, professional mourners are engaged by the bereaved relatives; these are usually of the female sex, and their assumed grief is of a very noisy description, dirges and loud wailings being the rule.

A very small grave is dug into which the body is thrust in a doubled-up position, with the face looking in an easterly direction. This ceremonial is attended by the sorcerers of the tribe, whose duty it is to find out the spirit responsible for the death, and also to make sure that the grave lies east and west.

Finally the warrior's spears and boomerangs are placed beside him, and the whole covered with many layers of brushwood and a small quantity of earth. A fire is afterwards lighted beside the mound and kept alight for a considerable time, its purpose being to attract the evil spirit and prevent it from doing further injury. This spirit is usually called "Bilya Backan."

Occasionally, however, the blame of the death is thrown on a mysterious monster—the dreaded "Bunyip," or "Wangul"—supposed to be a dweller amid the waters. The sorcerers of the tribes—"Boyl-Yas"—are, as may be imagined, highly important individuals, one of whose duties it is to cure and inflict diseases, and exorcise those possessed of evil spirits.

Their work is of a various and vague nature; the chief of their supposed accomplishments is the power to render themselves invisible, and to transport their spirits at will to any locality. The terror of the native Australian is the evil spirit called "Ginghi," who is supposed to come upon the scene at any moment to demand the life of some unfortunate. His presence is made known by the chief of the tribe, who, being suddenly inspired, swings a peculiarly shaped piece of wood through the air, causing it to make a weird, humming sound, imagined

to be the voice of the Ginghi. Any female who hears the dreaded sound without having been alert enough to anticipate it by covering her head, is at once speared, for on such a one the wrath of the evil spirit is believed to rest. The common ancestor of the aborigines is held to be a watchful god, by name "Piama."

The most interesting of their many ceremonials, from a spectacular point of view, is undoubtedly the "Corroboree," and the performance of this mystic degree of their "Bora" in the far interior is a sight to be remembered.[1]

I had not given much thought to the return journey, expecting to reach the north-west coast of Australia, where I had originally intended to emerge, in good time. But a serious calamity befell us which hastened my plans and caused us to resume our march hurriedly. Our younger camel, "Beelzebub" had grown almost unmanageable during our long halt, and one day on being saddled and equipped for a short prospecting tour, he broke from Stewart and disappeared in the bush before we could intercept him.

We searched the country for ten miles round, but could find no trace of the missing bull: he had eluded us completely.

It was now apparent that with our lessened means of transport we must proceed on our way at once in case of further accident retarding us. Our mining implements had to be abandoned, and much of our remaining supply of foodstuffs discarded, so that speedy progress might be made. We left the scene of our labours on November 17th, and headed WNW. towards the nearest north-western outpost on the Oakover river, nearly two hundred miles distant.

We reached Braeside station after four weeks' hard travelling over a country of undulating spinifex desert, even less auriferous than the barren wastes encountered on our outward march. The detailed mention of the homeward journey would be too lengthy for this narrative, and the country traversed has already been described by Rudall and Calvert.

Old "Slavery" died of sheer exhaustion a few miles from the Oakover channel, to my deep sorrow, for the faithful animal had served me well on several expeditions. We arrived at Port Headland on the coast a few days later.

Stewart, my trusted companion of many journeys, is now no more. He died a pioneer's death while accompanying me on a later expedition through the interior country, and the Southern Cross that he loved so well watches over his lonely grave. Mac, his comrade, is now at the Front with the Australian Bushmen.

Before closing this paper I should like to make a few remarks on what might be termed the water guides of Interior Australia. The subject is one of extreme importance to all travellers in the great bush-land, and many a man has owed his life to his knowledge of the drinking habits of birds and beasts indigenous to the country. Therefore I give my observations for what they are worth in the hope that some one may find benefit therefrom.

[1] "Bora"—meaning strange religious order comprising *Seven Corroborees*.

In the most arid portions of the desert, animal life is almost a negligible quantity, and birds only, therefore, may be considered as the guides of the central interior districts. Unfortunately water-fowl do not come under the heading of trustworthy guides further than to give an approximate idea of where water may be found. These birds take enormously long flights, and might, indeed, be heading for a lagoon over a hundred miles distant. They fly at a great height also, so that a true bearing cannot be obtained from them. Pelicans, for instance, when starting on a lengthened migration from one inland lagoon to another, first ascend straight into the air, circling slowly one after the other in a spiral until they appear as mere specks. Then the leader starts off in a direct line, and the others follow in single file. A man would require the properties of a camel to trace their flight to a finish.

Parrots, so numerous even in the most desolate tracts, are the surest water guides, in consequence of their habit of drinking both morning and evening. Pigeons, which at periods visit the far interior, may also be reckoned as trustworthy indicators of water at attainable distances. At certain seasons they appear in myriads, and in early morning they assemble in flocks to drink. It is rather an interesting sight to watch these beautiful creatures at such a time. If the ground is hard or rocky, they alight and flutter one after the other to the edge of the water; they hurriedly take a few sips and fly off towards the plains. If the ground in the vicinity of the pool happens to be muddy, or grown over with lignum, they will not venture to alight, and hover on the surface of the water until they are satisfied. Twice in the twelve hours they are absolutely reliable guides; in the daytime their movements are not to be depended upon, although their presence is always a sign that water is not far off. The beautiful bronzewing pigeon is also a methodical water drinker, but his kind do not fly in flocks, and so are more rarely seen than the plain pigeon. They approach the soak or claypan singly, and wait around the water until dark before venturing to drink. A bushman is never at a loss to find water if he happens to see a bronze-wing in flight towards the close of the day.

Of the parrots, the corellas and galahs are the most reliable indicators of the presence of water, especially if seen in the morning or evening; although if in the former case their flight traces *from* the pool or water-hole, and this should be remembered. Unlike pigeons, they fly to water in the evening and leave it in the morning. They usually hang about the water at night; and sometimes in the daytime, if the weather be very hot, they may be noticed in great white clusters clinging to the branches of the trees in the vicinity of a lagoon. Their custom is to travel in pairs towards their meeting-place, where they scream and chatter incessantly, making noise enough to attract the attention of any wanderer even if a good way off.

Cormorants are occasionally seen in the most central parts of Australia, and in very dry weather their presence should be most cheering to the traveller, as then they make a "bee-line" from lagoon to lagoon in search of fish. Their flight is somewhat peculiar; when seen a long way off they present an appearance not unlike a long snake flying

a little way above the horizon. They fly very low, and their direction of flight can therefore be fairly well ascertained.

Geese and ducks travel mostly in the night-time, and are at best but uncertain guides. Crows—the traveller in the desert's *bête noire*—are not to be depended upon as water indicators. I have seen crows at least a hundred miles from water of any description. The Westralian explorer learns to hate these horrid, ravenous creatures, the hideous convoys of many an anxious march; and his surplus energy is usually expended in cursing the "black devils," as they are there commonly called.

The insect-eating kite has also to be looked upon with suspicion, for this powerful winged bird has been known to travel for many hundreds of miles without drinking. Their habits are indeed strange; after a long flight they practically gorge themselves with muddy fluid, so that they occasionally die of over-drinking. They are not afraid of man, and will not endeavour to get out of his way.

Sometimes the traveller may find many of these birds lying on their backs by the edge of a pool, unable to get up or fly, so deeply have they partaken of the dull, lukewarm fluid. They are inveterate gluttons, and often drown in the shallow water by toppling over when attempting to absorb a second supply.

The emu may now be mentioned, but not as a water guide of any importance. Where this lordly bird lives and moves, water may be found at no great distance, and the bushman can easily locate it by studying the lie of the land surface.

So much for the habits of birds in the interior. As I have noted, animal life is not abundant on the central plains, yet occasionally the native dog may be encountered. His habits are, like the crow's, uncertain; his presence, however, may usually be taken as an indication that a tribe of blacks are "on the wallaby" not far distant. Kangaroos drink frequently when in well-watered country, but they can go for a long time waterless. Where they abound, however, water is not very far distant, and may be found by tracing the well-defined kangaroo pads.

There are regions in the great interior where water does not exist within an area of over a thousand square miles—as witness the desolate expanse of undulating sand country between the 19th and 23rd parallels. There little life of any kind is found beyond the snake, centipede, and lizard; but go where you will, the gaunt black crow cannot be shaken off.

Native "smokes" are rarely to be trusted. A fire might have been caused many days before the traveller sees it; the old Gins have a bad habit of throwing their fire-sticks down recklessly when vacating a camp, and conflagrations are often begun in this manner. Or the dying embers of a fire many days old might be fanned into flame and much smoke by a fresh breeze.

It is necessary to exercise extreme care and clear judgment in discriminating between trustworthy and untrustworthy guides. No sign should be neglected, nor any clue passed unnoticed. Possibly I have but said what more experienced men have noted before, and if so no harm can result in giving fresh publicity to a matter that is of considerable importance to prospective voyageurs in the land of spinifex and sand.

DEPRESSIONS AND ELEVATIONS OF THE SOUTHERN ARCHIPELAGOES OF CHILE.[1]

By Francisco Vidal Gormaz, Member of the Faculty of the University of Chile.

I.

This is a wide subject, and much has already been written upon supposed evidences of upheaval observed along the coast of Chile, but I shall confine myself to treating the following question: Do the archipelagoes of Southern Chile owe their origin to elevations of the sea bottom or to depressions of the southern and western part of South America?

I shall confine my remarks to the southern archipelago lying between Chiloé and the peninsula of Taitao, for the reason that I cannot go outside of that region without the discussion getting beyond convenient limits.

About 1857 an interesting work was published by our distinguished professor, Señor Ignacio Domeyko, upon the elevation of the coast of Chile—a work that was read with interest, and which led us to note down in our journal all the cases of movement in an opposite direction that were encountered from time to time.

Although we had found shells at high altitudes—a fact which supported the theory of elevations—the causes that in our opinion led to

[1] This paper, a copy of which was kindly sent us by Señor Roberto Maldonado, officer of the Chilian Navy, was first published in the *Revista Nueva* at Santiago de Chile in 1901. The original article is dated Santiago, August 24, 1877, and was awarded a prize by the University of Chile in that year. The subject is one of so much general interest that we have translated it for publication in English in order that it may have a wider circulation.

Whether the author's conclusions are correct in all cases may be doubtful, but his facts are entitled to consideration. We may well insist upon the conclusive nature of many of the facts given by Darwin, but Señor Gormaz frankly admits his own belief in local elevations of the coast of Chile, and his chief contention is that there is equally satisfactory evidence of local depressions.

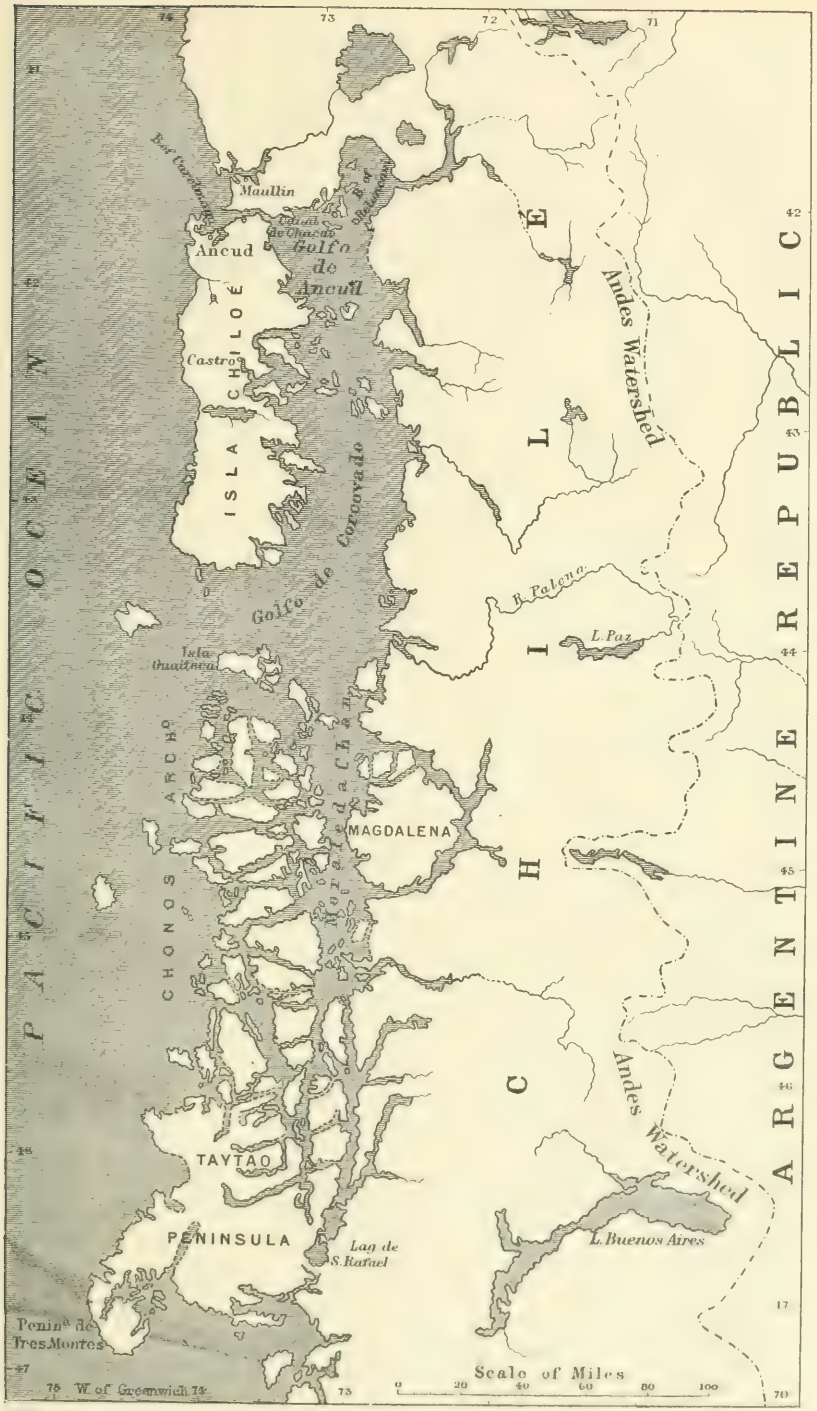
To Señor Gormaz's final question, as to whether the general relief of the south-west coast of South America is the result of elevation or depression, the answer is easy:—The physiography as a whole is most decidedly one of depression. But such an admission does not, of course, invalidate evidence of either later or earlier elevations of the same region, but of *smaller amplitude*.

For years we have been gathering evidence to determine whether certain coasts have been elevated or depressed, and have found satisfactory evidence of many movements of both kinds in the same region. We are much in need of criteria for determining the chronological order of such events.

In connection with the present paper one should read Darwin's *Geological Observations*, 2nd ed., London, 1876, chap. ix. pp. 232-282; *Sinken die Anden*, by Herr W. Reiss, Verhand. der Gesell. f. Erdkunde, Berlin, 1880, No. 1; and *Travels in Peru*, by J. J. von Tschudi, London, 1847, pp. 41-47.

The accompanying map is inserted for the use of those unacquainted with the loca details mentioned by the author. J. C. Branner.

Stanford University, California, U.S.A.,
October 10, 1901.



MAP OF CHILIAN COAST.

Illustrating Senor Gormaz's Article

the accumulation of these deposits, and their appearance at such remarkable altitudes, induced us to doubt the theory of the gradual elevation of the coast.

In the archipelagoes that border the southern coast of Chile the proofs of local depression are very abundant, and many of them are so characteristic that they lead one to suspect that the present relief of those archipelagoes may well be due to depressions along the western coast of South America.

In the course of these brief notes, we shall make no mention of those surface changes which the coasts undergo through the influence of rains, winds, tides, and storm waves. Such changes are going on all the time before our eyes, and are so rapid in some instances that they alter coast-lines very considerably in a few years. We shall also have but little to say of the geology, because the fossils that have been found in the archipelagoes of Tertiary and lower Quaternary ages are far removed in point of time from the modern phenomena with which we have to deal, and which may be considered as belonging to the historic epoch of Southern Chile. All that we shall attempt is to direct the attention of competent persons to certain evidence which seems to throw doubt on the generally accepted view that the coast-lands in question have been uplifted in recent times. We shall confine ourselves to a simple statement of the facts observed by ourselves or by trustworthy persons; and if the subject is not a fruitful one, it nevertheless offers some new data which should not be overlooked by those who, with wider knowledge than ours, may hereafter deal with the subject of the elevation of the coast of Chile.

II.

In 1857, while travelling through the vast labyrinth known as the archipelago of Chonos, we often noticed that small low rocky islands still supported the upright remains of a robust vegetation. Large trees, either dead, or partly so, buried their bare roots in the cracks in the rocks that were washed by the high tides, and their decayed trunks, covered only with parasitic plants, gave an aspect of life to those islands—eloquent witnesses of the terrible catastrophes of a very modern epoch.

It is not possible to conceive of this vegetation, now dry and enfeebled, having germinated upon these bare rocks that are beaten by the salt waters of the channels. It is necessary to suppose a depression in order to explain so remarkable a phenomenon—a depression possibly in part due to the powerful earthquake of November 7, 1837, which produced so many changes in the relief of the archipelagoes.

For the Chonos we may cite also another recent phenomenon: at the extreme southern end of the channel of San Rafael, which Captain Hudson (don Francisco) equivocally called the Laguna de San Rafael (46° 30′ S. lat.), it was observed in 1857 that, when the tide came in, it covered a large number of trees, and though some of these were alive, they were weakened by the salt water in which they stood. A long-boat of the *Janequeo* (a two-masted schooner of the Republic that explored those waters in the summer of 1857) while it was entering that

bay, or laguna as they were accustomed to call it, sounding with the full tide, and without having any reason to suspect what the waves covered, ran upon the branch of a tree and sprang a leak, which put the crew in serious danger on account of their being a long way from the land. When the tide went down it was found that the boat had passed over the remains of a forest, the roots of which were hidden in the sea.

Is it possible to suppose that those trees ever could have grown under such unfavourable circumstances? Only a recent depression of that region could have produced such results, and this may also be due to the earthquake already referred to, which caused so much damage in Chiloé, Guaitecas, Chonos, and the Gulf of Penas, that it is still recalled by the inhabitants of those places with horror.

Fifteen years later, in February 1871, Commandante Simpson, of the Corvette *Chacabuco,* which was exploring those districts, in describing the same region, says, in speaking of the Laguna de San Rafael: "All the bottom at the south end of this great bay is composed of low lands liable to overflow, and about its margins, under water which, even at low tide, is four metres deep, there is a forest of dead trees all of the same kind, chiefly oaks, such as occur on the land, and which never could have grown under such conditions. This phenomenon, which we observed at Punta Elefantes and other neighbouring places, can only be attributed to a comparatively recent sinking of the land. In fact, the pilot told me that after the great earthquake in 1837 he had himself seen many changes in the islands, and that though he did not recall anything about the place in question he thought it possible that the sinking might have occurred at the time of the earthquake."[1]

There are, however, in the islands of Chiloé two English sailors, Archy and Yates, who were witnesses of the phenomena produced in the Chonos by the sharp earthquake of 1837. The first of these was on the Guaitecas on the day of the earthquake, and he has assured us that, when he made his return voyage through that archipelago, he noted the disappearance of small islands that he had known, and observed the great havoc on others, and the presence of banks and rocks where formerly there was none. Finally, Mr. Yates, an aged seal hunter, found the physical aspects of the southern islands so changed after the earthquake that he had to go over it all again in order to recover his acquaintance with those regions, so much had their hydrography been changed. Mr. Yates is the pilot mentioned by the Commandante of the *Chacabuco.*

In regard to the archipelago of Chiloé, a region with which we are better acquainted, we can cite a larger number of facts regarding the local depressions. These data are unimpeachable, and tend to justify the theory confirmed by numerous trustworthy facts, that this sinking of the land extends beyond local limits.

In 1871, when charged with the exploration of the Bay of Reloncavi, we said:[2] "While at work upon the Laguna (de Quetru) many persons

[1] *Memoria de Marina de* 1871, p. 287.

[2] *Anales de la Universidad*, tome xxxix. 63.

called our attention to the fact that the lands that had been flooded by the sea had been arable lands a few years before, but were altogether useless at present for agricultural purposes. This depression, so far as it was possible for us to judge, was due to the great earthquake of 1837 that caused so much destruction in the archipelago."

On the uncovered beaches of the eastern coast of the islands of Chauques, as we were informed in 1871 by a reputable native of Chiloé, Don José Fructuoso Sanchez, there appear above the surface of the water immense trunks of larch cut with an iron axe, thus showing that that region had notably sunk within the historic period, in spite of the fact that there is no tradition confirming it. Such a depression is really modern, for it is not easy to imagine that those great trunks could have been cut down with the fragile stone axe used by the natives prior to the conquest.

At the extremity of the estuary of Castro, near the village of the same name, the first capital of the archipelago of Chiloé, are to be seen the remains of a forest and of *quilantares* at the time of extreme low tide —remains which are additional evidence of the depression which that region has undergone at a very modern epoch.

Lastly, on the south point of San Augustin on the north coast of the estuary of Rulo, there is a row of trees (*tiques*) leaning toward the sea whose roots are uncovered and washed by the high tides. This also shows that the coast has undergone depression, for it would not be possible to explain otherwise how those trees could have grown under such unfavourable conditions. Some aged residents of that district who are witnesses of this phenomenon told us that "the sea was rising gradually and flooding the land."

Cases such as we have mentioned are to be observed at many points showing the advance of the waters of the ocean, and consequently the local depressions that the southern archipelago undergoes.

In view of these facts, the question necessarily arises, whether the peculiar relief of the region referred to is due to continued depression, or to an elevation of the bottom of the sea such as some persons hold.

III.

Celebrated geologists who have visited our shores are of the opinion that the formation of the extreme southern end of South America is due to sudden elevations. Darwin, however, without denying the sudden elevations, supposes that the rise of the land probably goes on slowly, but he also admits that extraordinary elevations may be produced by earthquakes.

That local elevations have taken place cannot be doubted, for evidence of such is encountered on the eastern coast of Patagonia, Quintero, Valparaiso, the shores of Colchagua, the island of Santa Maria, Tubul, Lebu, Molhuilla, Corral, etc., but it is no less certain that local depressions have occurred, due probably to the causes which produced the elevations. This is especially true of the region with which we are at present particularly

concerned, and the phenomena we have referred to, it must be remembered, belong to recent times. But we are very far from regarding the present relief of the southern archipelagoes as due to an elevation of the bottom of the ocean.

Darwin says he found at an elevation of six metres above the level of the sea, recent shells of molluscs that live on the neighbouring shores of Cape Tres Montes (46 50′ S. lat.), and also at various other points. From this he infers that those places had risen from the bottom of the sea at a very recent date, and that consequently the formation of those regions is due to an elevation. The views of this eminent observer are worthy of all respect, but we shall try to show that the facts can be otherwise explained.

The southern islands being thickly wooded, and presenting here and there small unwooded patches on the high shores, the sea-birds that live on fish and shellfish are obliged to carry to these points the daily food furnished them by the tides. We have seen the gulls gather on the rocks of the shores several kinds of molluscs—*choros*, *quilmahues*, and *tacas*—which they carry to those bare heights, and there deposit them. Then, in order to get at the tit-bit inside, they introduce a little stick or pebble at the opportune moment when the shell opens. Of course the shell cannot close again, and its contents are then quickly extracted. This ingenious device may readily be observed by any one travelling in those latitudes. It is doubtless the gulls, therefore, we have to thank for the occurrence of different kinds of shells at high elevations, the species being always indigenous to the neighbouring shores.

The *traro* (*Caracara vulgaris*, Cuv.),[1] the *huarro* of the Chilotes, which always builds its nest in the woods and well inland from the sea, feeds its young upon shellfish, for it has no other resources in that region apart from those which the shores afford.

This fact also shows why we find, in regions so far from the coast, shells belonging to species that live in the neighbouring seas. This hawk carries to its nest several kinds of molluscs (*cholgas*, *quilmahues*, *tacas*, *culeghes*). In Chiloé it is in the habit of carrying the shells to the region of the larches, at an altitude of 800 metres. The *tinqui* (*Caracara chimango*)[2] has the same habit as the *traro*, but it never goes very far from the coast.

On bare shores like those of Arauco, Colchagua, Conchali, and others, the sea-birds have a no less ingenious device which is both quick and sure. On catching his prey the bird rises vertically by flying round and round, and when he has reached the proper height, lets go his shell, and, folding his wings, descends to the shore as fast as gravity can carry him. The shell on striking the ground is broken, and the bird spreading his wings again falls upon it and makes his meal, without the trouble of having to wait like those that inhabit the wooded shores of the southern archipelagoes.

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[1] *Polyborus tharus*, a kind of carrion hawk.

[2] *Ibycter chimango*.

Frequent mention is also made of the fact that large deposits of shells are found on the hills of the coast. Darwin himself cites many examples: "These shells," he says, "are buried in a dark sediment two or three feet thick, composed for the most part of very small fragments of serpulæ and marine shells, it being noteworthy that these remains belong to species that live to-day on the neighbouring shores."

It seems as if this fact were an incontestable proof of uplift; but we do not so regard it. The Chilotes, as well as the ancient Chonas Indians before the conquest, were in the habit of cooking shellfish in holes made on land, and called *curantos*. They lived on the hills of the coast, and, as shellfish were their principal food, they went down to the shore to gather them at time of low tide, returning afterwards to their habitations. Close by each house was one of those curantos, and similar holes or pits are sometimes seen near modern habitations. The shellfish, put into a curanto, were covered with small stones strongly heated, and thereafter the opening was hermetically closed. After an hour or more, when the molluscs were supposed to be sufficiently cooked, the pit was opened and surrounded by the family, who began their meal, throwing the shells behind them; so that the continued repetition of this process resulted ere long in the formation of immense deposits of shells. When the accumulation of shells made the place inconvenient they changed the location, and opened a new pit. It may be mentioned also that on many beaches there occur similar remains left by travellers or by shellfish hunters, as may be seen on all the islands of Chiloé, in the Guaitecas, and on the Chonos, these last regions being much visited by wood hunters and fishermen. In the well-populated parts of regions near shores where shellfish are abundant, the heaps of shells formed by the *curantos* are very extensive, and are always found beyond the reach of the tides, and upon hills, in positions which have been determined by the nature of the ground.

When the deposits made by the *curantos* are abandoned, either on account of the accumulation of shells, or of the exhaustion of the supply of shellfish along the neighbouring shores, vegetation soon covers them, and the shell heaps become concealed under a thin layer of earth, which increases with time. Should we then wonder at finding these ancient deposits "buried in a dark sediment two or three feet thick," since they must be mixed with bits of charcoal, ashes, and burnt earth? In view of what takes place every day in those archipelagoes we readily recognise these deposits as the refuse of ancient *curantos*, preserved for centuries.

It should be observed also that the remains in these *curantos* generally have the valves of the shells entire, for, having been cooked by steam the hinge is quite elastic, and the shell can be opened without being broken. The objection, therefore, that might be made in regard to a great part of the shells being found entire has very little force. Upon the whole, then, and in view of the facts referred to, we are hardly justified in regarding those shell accumulations as trustworthy evidence of the recent elevation of the southern archipelagoes.

IV.

The shallowing of the Bay of Carelmapu at the western entrance to the strait of Chacao, is another fact cited in support of the theory of recent successive uplifts. According to Father Gonzales de Agueros, it was considered an excellent bay in 1643, while at present it is only navigable by small boats and one-masted sloops.

Father Pedro Gonzales de Agueros says in his *Descripcion Historial de Chiloé:* "At present this port (Carelmapu) does not exist, for a sand bar having been formed in the course of time, and having increased in size, the port has become useless, and is only available for canoes."

We do not see that these words can be interpreted to mean an elevation that rendered the Bay of Carelmapu useless, for the only deduction is simply the formation of a sand bar—a genuine bank—which had taken possession of the bay, and rendered it useless as an anchoring place for vessels of greater draft.

How such a thing could come about is easily explained, without having recourse to the general preconception of elevations. Even if it be allowed that we have unquestionable evidence of elevations upon our coast, we are not justified in believing that the movement has operated without interruption along the entire length of our coast.

At the time of tidal flow the channel of Chacao is washed by a current having a velocity of from ten to thirteen kilometres an hour, so that that strait has the appearance of a rushing river: and, when the bars and the capricious changes of its bottom and its banks are taken into account, can we wonder that in the Chacao similar forces operate especially in the bays and quiet waters? Let us see.

If Agueros considered Carelmapu an excellent bay in the seventeenth century, while to-day it is only a shallow one, and unfit for large vessels, that is no reason for assuming an uplift, for on the neighbouring coasts there is no evidence confirming it. Besides, the phenomena we see in operation to-day bearing upon the shallowing of certain bays, prevent our acceptance of the theory of sudden elevation.

The shallowing of Carelmapu, as well as of Ancud, the channel of Cailin, the port of Godoi, and other places is due to the accumulation of sands carried by the marine currents. The rapid waters of Chacao, moved by the ebb and flow of the extraordinarily swift tides, deposit in the curves of the coast a part of their load, and the successive accumulations eventually form the bars as we see them.

In the bay of Ancud an extraordinary bar has been reported, and we are told that during the last century, according to the map of Moraleda, the shallowest part was four Spanish fathoms deep, three in 1835, according to the observations of the *Beagle*, and barely two fathoms according to the soundings made in 1870 by the officers of the *Cavadonga*. If such a striking shallowing be attributed to a movement of elevation, the coasts of the bay would have shown it, or the tradition of it would have been preserved, which is not the case. It is due solely to the accumulations produced by the loaded currents depositing their materials in the dead waters, or at the point of contact of the currents.

The sunken rocks of Remolinos and of Puguenun, genuine gauges set there by nature to show any elevation or depression that this region might undergo, tell us nothing in support of the theory of elevations; and the same is true of the rocks of Guapacho at the entrance to the Bay of Ancud.

The Spanish pilot, Don Jose de Moraleda, explorer of the archipelago of Chiloé, about the close of the last century, in referring to the shallow waters of Guapacho, says, that "at low tide there are uncovered some points of rock which are soon hidden again, and reappear continually when there is a heavy swell: but when there is no swell, they seldom show any signs of their presence: and for this reason are the more dangerous." These rocky points of Guapacho have very rarely appeared above the surface of the water during the past eighty-eight years.

The well-known Remolinos rock on the other hand—the reef that caused the removal of the town of San Antonio de Chacao to old San Carlos, now Ancud—was struck by the keel of one of the ships of Don Antonio de Vea in 1675. This is the only rock that now becomes visible, but merely as a black point, at the last stage of the ebbing tide, while at high tide it is five metres below the surface of the water. If an elevation had taken place, this rock would have indicated it. If since Vea's time there had really been an elevation of the bottom of the sea, the Remolinos rock (also called Petucura), two hundred years ago, must have been at a sufficient depth to leave free passage to vessels of deep draft, and the Vea's accident therefore could not have occurred.

Again, at the present time, the rock does not appear above the water at ordinary low tides, but stands about a metre above the lowest tide, from which it is to be inferred that when Vea struck the Remolinos rock, it must have been covered by about three metres of water, for it is well known that only after the middle of the rising tide, in ordinary cases, can a vessel coming from the Pacific to the anchorage of Chacao reach this point.

We might accept the forced interpretation given to the words of Father Agueros already cited, which are appealed to by many who have discussed the elevations of our coasts, if the condition of the neighbouring coasts were not opposed to such a view. And we shall, at the risk of being tedious, try to show that the theory of the elevation of Carelmapu is untenable.

That bay was sounded for the first time in the month of November 1558, by Captain Cortes Ojea, who reports finding from one to ten Spanish fathoms of water.[1] In 1835, according to the map of the officers of the *Beagle*, the depth varied between half a fathom found at the anchorage and one fathom in the middle of the bay. Comparing these figures one logically concludes that the depth of Carelmapu has diminished 8½ metres in the past three hundred and fifteen years.

If the shallowing of that bay were due to elevation, the neighbouring

[1] Gay, *Historia de Chile*, 2 vol. Documentos.

shores would yield evidence of uplift, and the Remolinos rock would afford unquestionable proof of it, for it ought now to stand more than six metres above the water at low tide, and consequently should always be visible at the highest tides; as a matter of fact, this does not happen.

From the former calculation, we infer that the rock referred to is exposed at present only at the moment of the lowest tides, when it is one metre above the water, and is covered by five metres at high tide. Extending the calculation into the past, it would follow that the rock in 1675 would have been eleven metres below the water at flood-tide, and $5\frac{1}{2}$ at ebb of the greatest tides. This shows once more that, if we accept the theory of elevation, the mishap of Don Antonio de Vea could not have taken place, for the Remolinos reef would then have been seven metres below the water, since, as has been said, no sailing vessel, and much less the ancient galleons, coming from the Pacific to the Archipelago of Chiloé, could reach Remolinos before the tide was half in.

The remarks concerning Remolinos are applicable to the English bar, to the rocks of Guapacho, Pugueñun, and to other points in the neighbourhood of Carelmapu, and this demonstrates clearly that the shallowing of the bay of Carelmapu cannot be the result of elevation of the sea-floor.

V.

We have already stated that the shoaling of that bay is due principally to the materials brought into it by the tides, but certain other occurrences within the historic period of Chiloé may well have contributed to the growth of those extraordinary banks, which have rendered that bay useless for all sorts of vessels.

The same Father Agueros describes an earthquake felt at Carelmapu on the morning of May 14, 1633, which completely destroyed the town, and later, he mentions the fall of an aerolite in the sea, which caused great agitation of the waters.[1]

The commotion felt on the coast, and the resulting débris swept away by the rough waters of Chacao, must have hastened the shoaling of the bay. On the 24th of December 1737 there was another earthquake, more violent than the former, which destroyed the greater part of the villages of the archipelago and the city of Valdivia.[2] The tidal movements caused by these phenomena must have contributed to the growth of the banks, and finally, the earthquake of November 7, 1832, probably operated in the same direction. The earthquake of 1837 caused in Chiloé and the southernmost archipelagoes much devastation, while a great tidal wave on the shore caused notable surface changes in the coast-line. A current popular story, taught to the children of the public schools of Chiloé up to a few years ago, told of the devastation caused in Carelmapu by the invasion of the sea, and by the earthquake

[1] *Descripcion Historial de Chiloé*, pp. 101-104.

[2] *Descripcion Historial de Chiloé*, pp. 104-105. Astaburuaga, *Diccionario Jeográfico de Chile*.

of November 7, 1837. It is evident, then, that the phenomena produced by that great earthquake are worthy of some consideration: they would account for the destruction of the coast, and for the agitations of the sea, which have contributed to the shoaling of the bay and to the surface changes.

From the fact that there is clear evidence of local depressions having taken place in the southern archipelagoes, while at the same time there is certainly a lack of unequivocal evidence in favour of any gradual or periodic elevations, it is obvious that the whole question of the origin of the present coast-lines of those regions must be reconsidered.

ON THE DISTRIBUTION OF CERTAIN FOREST TREES IN SCOTLAND, AS SHOWN BY THE INVESTIGATION OF POST-GLACIAL DEPOSITS.

Paper read before the Botanical Section of the British Association on 13th September 1901. By Walter N. Niven.

With Map.

It is proposed in this short communication to bring before your notice some results of the investigation of post-glacial deposits, in so far as they throw light on the distribution of the trees composing the forests which covered the whole of Scotland in early post-glacial times. It is well known that these forests were largely destroyed by changes in climatic conditions, by the submergence of many parts of the land, perhaps by the blowing down of entire woods by wind, as in the case of Drumlanrig Wood in Dumfriesshire in 1756, and by other means. Man also played his part in the process of destruction. In early historic times we read of the Romans cutting down trees, and utilising their trunks for roadways across marshes, and for bridges. This is confirmed by the discoveries in Lochar Moss and Flanders Moss respectively. It will therefore be seen that if we wish to obtain information concerning those ancient forests, we must search for it in the submerged forests around our coasts, in the peat or peat bogs of our Highlands and Lowlands, and in the numerous fluviatile and lacustrine deposits throughout Scotland.

As many of the buried trees are found in an upright position, there should be no difficulty in acknowledging that they must have grown at the places where now discovered. In many cases the trunks, and very often the leaves, are found scattered throughout the peat. It is to be regretted that only a very few of the deposits have been systematically examined, *e.g.*, Cowden Glen in Renfrewshire, Hailes and Corstorphine in Edinburghshire, and Elie in Fifeshire.

MAP OF
SCOTLAND
TO SHEW THE DISTRIBUTION OF TREES
IRELAND

The information on this point has been obtained principally from occasional references in topographical books of Scotland to the discovery of trees in particular districts, in digging peat for fuel, in making railway cuttings, and in similar operations. The following trees are so recorded :— Hawthorn, elder, common ash, birch, alder, hazel, oak, willow, yew, and fir, all of which are, with the exception of the ash, commonly regarded as indigenous to Scotland. In addition, according to Dr. James Geikie, the cones of the silver fir, which is not considered a native, have been discovered in Orkney (*Great Ice Age*, 3rd ed., p. 287).[1] Several shrubs, including the juniper and raspberry, as well as many flowering plants, have also been unearthed. The localities where the various trees have been found are marked on the accompanying map.

The records, which have been obtained from references in over seventy volumes on Scotland, are probably not complete, but those collected may be considered sufficient to show the ancient distribution of the forest trees. On glancing over the map, it will be seen that there are few parts of Scotland, however treeless at the present day, that were not, in remote, and even in comparatively recent times, covered with a considerable quantity of woodland.

As the deposits are too numerous to describe in detail, a few only will be mentioned, which will give an indication of the nature of the records collected. Mr. George Low, in his *Tour through Orkney and Shetland*, published in 1774 (p. 146), states that he observed, when crossing from the parish of Delting to Yell, in a bank where the sea had carried away the loose earth, a layer of large pieces of wood in a horizontal position, a few inches above the hard gravel, and covered with about 10 feet of moss. He also further remarks, that this layer continued, so far as he could ascertain, the whole length of the bank and probably round the bay ; it consisted of pieces from eight inches to half an inch in diameter, roots, stock, and, in a word, all parts of a tree. He was of opinion that the wood was hazel. From other records I find recorded birch and hazel in the Shetland Islands, and in the Orkneys fir, birch, and hazel.

The Rev. Charles Thomson, minister of Wick, writing on this parish in the *New Statistical Account* (vol. xv. p. 129), dated 1841, mentions that "in the Bay of Keiss, between the links and the sand, and running down under the sea, there are found remains of a submarine forest. The barks of the various kinds of trees are quite discernible, and even the seeds of the birch and ash are so well preserved as to appear but lately fallen from the tree." This is the most northern record of the ash we have. In Inverness-shire, while making excavations for the Caledonian Canal, numerous trees were found, principally very large oak trees, some of which measured 24 feet in circumference (*New Statistical Account*, vol. xiv. p. 9). In the parish of Croy and Dalcross, in the same county, it is recorded that there were extensive forests of oak, birch, fir,

[1 Professor Geikie now thinks this determination is doubtful. It was given by him on what was stated, in the work consulted by him, as "good botanical authority," but he has mislaid the reference.—Ed. *S.G.M.*]

and hazel, which had been converted into moss, upwards of 20 feet deep. In a moss in this district, 400 feet above sea-level, oaks of extraordinary size have been dug up, some of them measuring 50 or 60 feet in length, and of proportional thickness. At a height of 800 feet, large blocks of fir have also been found. In some of the peat bogs in Glenavon, Banffshire, roots of pine have been found at a height of 3000 feet above sea-level (*New Statistical Account*, vol. xiv. p. 449. Old *Statistical Account*, vol. xii. p. 451).

Throughout the midlands there are abundant records. Coming south to Renfrewshire, where we have now no natural woods, remains of what seems to have been the forest mentioned in the Chartulary of Paisley Abbey, have been found in the parish of Kilbarchan (old *Statistical Account*, vol. xv. p. 484), where in the mosses oaks have been found in a perfectly fresh condition, standing in their original position.

From the ancient lake of Cowden Glen in Renfrewshire, birch and hazel have been unearthed. This deposit has given rise to much discussion, some being of the opinion that it belongs to the interglacial period, while others believe, judging from the discovery of plants of recent occurrence, that it should be considered a post-glacial deposit.[1]

The writer has examined the peat bogs above Greenock and at Bishoptown, but has only been successful in finding, in the peat near Loch Thom at a height of upwards of 500 feet, the roots and trunks of birch trees. There is much difficulty in making fresh discoveries; the only way in which this can be done successfully is by making extensive excavations in the peat, as the trees are usually found many feet below the surface, but this is now almost impossible.

Around Edinburgh, the lake deposits of Corstorphine and Hailes, the raised sea-bottom of Fillyside, and the peaty deposits of Gayfield and Redhall, have been carefully examined by several authorities, including the late Mr. Bennie of the Geological Survey. In them the following trees have been reported:—Hawthorn, elder, birch, alder, hazel, yew, and fir. It should be mentioned that the Corstorphine deposit is considered by some authorities to belong to the late glacial period.

In the extreme south of Scotland, close to Monreath at the Mull of Galloway, Sir Herbert Maxwell, Bart., M.P., has observed fir and oak trees. In this county, Wigtownshire, Sir Arthur Mitchell has made the following observations on the ancient forest of Cree, which may be of interest. "The trees, which as far as I know are all oak, are found in two distinct positions, first, in the channel of the Cree, or projecting into its channel from the banks at the side, many of these last having 10 to 15 feet of sandy clay above those parts of them which are on the bank, and an unknown number of feet of clay below; and secondly, under the peat on the surface of the clay. The existence of this ancient Cree forest does not rest on our finding some half dozen trunks. You may count them by the hundred, exposed in the bed of the river, between Newton-Stewart and Barsalloch, and you may reckon roots by the score

[1] The deposit in question rested upon and was covered by glacial accumulations, and there can be no doubt, therefore, that it is of interglacial age.—ED. *S.G.M.*]

where the moss has been cleared away near the mouth of the Lorne Burn. I say roots in this case, because such trunks as are discovered in peat castings are carted off at once. The trees are described as of great size, and specimens measuring 15 feet in girth and 50 feet in length are not uncommon" (*Proc. Soc. Ant. Scot.*, vol. v. pp. 20-29).

With those short notices of a few of the deposits, I will now sum up briefly the general distribution of the trees as shown by the deposits in general.

The oak is very widely distributed. Its most northern occurrence is Caithness-shire, and it is recorded in every other county. It has even been found in the now treeless islands of Lewis and Tiree. We have already noticed its occurrence at a height of 800 feet, where no oak can flourish now. It is interesting to notice that many of the oaks are of enormous size. Sir John Clerk reports having seen an oak 70 feet in length at Drumcrieff (*Reliquiæ Galeanæ*, p. 333).

The Scots fir, probably *Pinus Sylvestris*, is another widely distributed tree. It is common in the northern counties, in the Orkney Islands, and Lewis, in all the midland counties, with the exception of Forfar and Fife, but in the southern counties it is only recorded in Renfrew, Edinburgh, Roxburgh, Dumfries, and Wigtown.

The hazel has been found in the submerged forests and in many parts of the Orkney and Shetland Islands, and also in some of the Western Isles. There is no record of its occurrence in Sutherland, but throughout the Midlands it is fairly plentiful, and in the Lowlands it has been found in all the counties, with the exception of Haddington, Linlithgow, Selkirk, Dumfries, and Wigtown.

The birch is another common tree. It is recorded in the Orkney and Shetland Islands, and in the majority of the counties from Caithness to Wigtown.

Regarding the other trees there are few records. The alder is recorded from Lewis, Banff, Aberdeen, Kincardine, Perth, Fife, Argyll, Lanark, and Edinburgh.

The willow, which variety I am unable to say, occurs both in Caithness and Sutherland in most northerly situations. It has also been obtained from the peat-bogs in Renfrew, Lanark, and Roxburgh.

The ash is reported, as already stated, as having been found in the Bay of Keiss, Caithness-shire. It is also recorded from the mosses in Ballantrae, Ayrshire, and Bowden parish, Roxburghshire.

The only records of the occurrence of the hawthorn, yew, and elder are obtained from Edinburghshire. This scarcity of records must be due to a want of investigation, for there can be no doubt that those trees must have been widely distributed throughout Scotland in the past.

The results derived from this investigation of post-glacial deposits are twofold. 1st, They show that the principal forest trees were formerly more widely distributed than at present. 2nd, They indicate which trees must be considered indigenous in Scotland.

We have just seen that in early post-glacial times, the now bare and bleak Orkney and Shetland Islands, and the treeless Western Isles, were covered with trees: the oak, for example, flourished in all the counties,

though now, according to Professor Trail, in his Topographical Botany of Scotland, published in the *Annals of Scottish Natural History*, it does not grow in the Orkney and Shetland Islands, Caithness, Ayr, and Selkirk. In the Hebrides it was introduced by man. In a note on *Quercus Robur*, Professor Trail states that the fact that this is native in the Highlands is shown alike by the remains in peat-bogs, and by the frequency of the Gaelic name in the names of places, and that probably it has been introduced into every other district in which it was not already native (*Annals of Scottish Natural History*, No. 31, p. 166.). But the investigation of peat-bogs and the other deposits shows that the oak was one of the prevailing native trees of the ancient forests, and flourished all over Scotland. With regard to the alder, this tree has been supposed to have been introduced by man into the Hebrides, but here again it must be considered native, as it has been found in the peat bogs of Lewis. Finally, the ash is stated by Sowerby, in his *English Botany* (p. 56), "to be perhaps not indigenous in the Highlands and extreme north of Scotland"; in Bentham and Hooker's *Flora*, it is said to be common in Britain and truly wild, excepting in the northern parts of Scotland; while Professor Trail, in his *Topographical Botany*, states that its nativity is scarcely to be determined. But from the evidence I have collected, it might be said with some certainty that the ash is indigenous not only in southern Scotland, but also in the North. The record of it in the Bay of Keiss, which has already been mentioned, may be considered as trustworthy, and its occurrence in the peat-bogs of Ayrshire and Roxburghshire must also be accepted. Hugh Miller has also reported finding the ash in the brick-clays of Portobello, which, however, belong to the glacial period. Confirmation as to its existence as a wild tree in the South is derived, further, from the fact that many of the implements found in the crannogs are made of ash wood.

In closing, it should be noticed that while we have been only endeavouring to illustrate as far as possible the distribution of the forest trees found in the various post-glacial deposits, there is no doubt that if a more minute examination was made of many of them, shrubs, flowering, and probably some flowerless, plants, would be discovered. This would, as in the case of the trees, indicate which of the existing plants are native, and where they grew in the past.

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THE GOLD-PRODUCING REGION OF WEST AFRICA.

By S. J. Speak, A.R.S.M.

During the last dry season (November to April) I had occasion to journey through parts of the Gold Coast Colony and Ashanti, and it has been suggested to me that a brief statement concerning the conditions and prospects of the country would be of interest.

The gold-producing country embraces practically the whole of the basins of the three rivers: the Pra, the Ankobra, and the Tanoe. The Tanoe and Ankobra rivers are navigable for small boats for considerable distances, and the trade of those regions passes mostly through the ports of Half Assini and Axim. The Pra river (which with its tributary the Offin drains a large portion of Ashanti) is not navigable, and the trade of this region and most of the interior trade at the present time, passes through Cape Coast Castle, but when the railway from Sekondi, on the coast, to Kumassi is completed, in all probability Kumassi will become the great centre of interior trade.

From Cape Coast it is about 137 miles by road to Kumassi, and so far as the Prah river (Prahsu, 70 miles) the Government has constructed a good foot-road. The remainder of the path to Kumassi is well cleared, but is unformed. In the past, merchants have found it impracticable to trade in Kumassi owing to the difficulty of arranging their transport, but with the opening of the railway an important trade centre will be established, because Kumassi and the hinterland are much healthier than the coast. From Cape Coast Castle there is another important road to the north-west, tapping the districts at the head of the Ankobra river, but this path is now falling into disuse, for with the development of gold-mining in the Tarkwa district new roads have been opened, and it is now more convenient for the Ankobra river district to trade with the ports of Sekondi and Axim. For the development of the country the difficulty of arranging transport is even a greater drawback than the climate. If the white man could travel more expeditiously, and with more comfort and better food, he would accomplish far more work and have less sickness. The whole country is reticulated with small paths along which carriers can struggle with sixty pound loads if not too bulky, but along these narrow paths an average of 15 miles per day is good progress. On wider and well-cleared paths 20 miles per day can easily be accomplished, and the white man can be carried in a hammock. Many of the old native paths show evident signs that they were formerly kept clear for a width of about 6 feet, and it would seem that before the powers of the native chiefs were undermined by the British Government, they were able to make their people attend to the paths better than they can now. In the Gold Coast Colony and Ashanti there are very few steep hills which could not be avoided, and the surface of the country has such gentle inclines that good roads could be everywhere constructed, but as in all jungle countries this should only be done after careful exploration and survey, because it is impossible to obtain a

bird's-eye view of the surface unless a balloon be employed. A few good roads along which motor vehicles could travel—or else light tramways, which would eventually be as cheap, considering the cost of maintaining an ordinary road—would minimise the present difficulties very considerably.

The character of the inhabitants of a country is of course a very important factor to be considered in connection with possible commercial developments. The bulk of the people are Fantis or Ashantis, who are of the same origin, but they vary considerably in their degree of civilisation. There are very many Fantis capable of occupying such positions as minor clerkships, but these as a rule are expert blackmailers and thieves, for education does not appear to give them any conscientious scruples. They are nevertheless useful, because, owing to the unsuitable climate, the number of white people will always be kept at a minimum. It is interesting to notice that the self-styled "scholars" among the Fantis have no desire to adopt European civilisation in its entirety; they prefer the Fanti laws as to ownership and succession to property. By these laws a girl is only legally married when she has received the consent of her family. Children are always considered as belonging to their mother's family, and usually inherit nothing from their father. A man can to some extent direct how such of his property as he himself (without any help from his family) has acquired, shall be disposed of at his death, but in the ordinary course it goes to his mother's descendants. All inherited property belongs thus to families, and although nominally vested in the head of the family, can only be disposed of by consent of the whole family. On account of these customs it is difficult for a European to legally acquire any large tract of land; and to prevent fraud, it has been found necessary by the Government to make special inquiry into each case where property or other rights are claimed to have been sold to Europeans. The recently instituted Concessions Court, which is examining many mining claims of this sort, will cause much irritation and delay, but is necessary in the Gold Coast Colony. In Ashanti the Government has virtually assumed all the mineral rights; under certain restrictions chiefs are nominally allowed to dispose of them, but they can only receive payments of rent, etc., through the medium of the Resident at Kumassi, which is an excellent inducement for them to keep on their good behaviour.

Besides the Fanti "scholars" there are large numbers of rough carpenters, blacksmiths, and similar workmen, so that near the coast civilised conditions prevail. Communication with Ashanti and the hinterland is very frequent, and none of these people are living in the benighted condition suggested by the accounts of the atrocities which used to occur in Kumassi. The Ashantis have long ago seen that the chief effect of British government has been to diminish the powers of the chiefs, and thus destroy the native organisations, and they as a warlike people have realised the value of their organisations, and jealously guarded them. These people are very well informed, and there is little doubt that the recent rebellion broke out because they were aware that we were busily occupied in South Africa.

In every Ashanti village there is a main thoroughfare in which shade-trees have usually been planted, for it seems to be considered necessary to have a comfortable place for gossip and palaver. The typical house surrounds an open court or yard; the rooms of the house are partially or entirely open towards the court, and without windows or doors on the outside. The court is entered by a door or opening in one of the corners. With the natives near the coast, this type of house is generally modified, in some degree approaching the European idea, and solid mud walls, hinged doors, shutters, and windows are common, but these houses need not be described. Another common feature of the real native house is that the floor is always of mud, and raised to a height of 2 ft. to 2 ft. 6 in., and also the sides of the house are generally plastered with mud. After erecting the framing of a room the sides are closely palisaded with sticks, and finally there are numerous horizontal pieces of split cane or such pliable material tied on so as to give an effective holding to the plaster. When any ornamental design is to be made in the plaster, the leading lines are traced out and tied on in the shape of thin strips of cane.

In the jungle, the roof of the house is invariably covered with thick mats made from the leaves of the rattan palm when they are available. The West African jungle is, however, not so well supplied with this thatching material as most tropical jungle. The ridge of the roof is generally made waterproof by laying plantain leaves over it. Roofs thatched in this way are afterwards well smoked, in order to destroy caterpillars or other pests in it. The floors of the rooms are kept clean and in good condition by repeated smearings with red clay, and the walls are frequently washed over with white clay. It has been suggested that the natives build their houses off the ground in order to escape malaria, but the evidence for this conclusion seems to me to be scarcely sufficient. In the jungle, a house must have some kind of raised or prepared floor in order to be above the wet and dirt; if such precautions were not taken, the ground would continually be covered with weeds and sprouts of trees. Both in the case of Malays and West Africans, the raised floors seem to me to be sufficiently accounted for by their convenience.

Many misconceptions prevail as to the domestic hygiene of the Ashantis. The sanitary arrangements are usually very good, although primitive in construction. In every village there is a latrine (often covered) which is decently used. The natives are very careful to keep their digestive organs in order, and freely use medicines and enemas for this purpose when necessary. They also carefully clean their teeth with tooth-sticks. It will be evident from this that they are far superior to many other of the native inhabitants of Africa.

Commercial Conditions.—At the present time the development of the gold resources of West Africa is receiving much attention. There can be no doubt that more surface gold occurs in that country than in any other part of the world. The natives have already extracted immense quantities, chiefly by sinking small pits to a depth of ten or twenty feet, and then extracting and washing the gravel lying on the bed-rock. These pits are usually circular, with a diameter of about two and a half feet, and are sunk by using an iron-shod stick. The miner ascends or descends

with the help of this stick; he jams his stick obliquely across the shaft and lowers himself to his arm's length, and then jams himself by his back and feet in the shaft, and lowers his stick another step. The gold is washed from the gravel by means of a shallow wooden dish similar to a "batea," and this is considered to be women's work. There must be many millions of such shafts in the country. In several places the natives have also successfully extracted gold from the solid rock—quartz reef or banket veins—and in these places the superior skill of the white man can be profitably employed. There are thus thousands of square miles of gold-bearing country offering better initial prospects than any similar area of the globe. Several reefs have been ascertained to be of more than average richness, but several show evidence of varying and pinching frequently in size and value. These compensating advantages and disadvantages we may suppose will probably bring the average value to approximate somewhat to the world's general average, and that there will be a good proportion of good mines, and not a large number of fabulously rich ones. If therefore the conditions of working are at all comparable with those existing elsewhere, we may expect a good proportion of successful mines to be developed with the completion of the railway. The districts in close proximity will, as far as wood, water, and supplies are concerned, be very favourably placed. In the important question of labour the industry will be less fortunate. With the completion and extension of railways, a large number of natives now occupied as carriers will require other means of obtaining money. As has been previously indicated, a native can obtain his food comparatively easily, but to provide clothes and other things which have become necessaries to him, he must and will produce something. There is at present a scarcity of labourers, but experience seems to show that if mining companies will assist natives to build their houses on the properties, and afford them convenient means of obtaining food and spending their wages, large numbers will settle down and look to the manager as their chief if he treats them considerately. It is of the highest importance that the native labourers should be properly handled. These natives are an intelligent people, and are experts at "humbugging" the white man. This has arisen in the past because of the scarcity and inefficiency of European people in the country. On account of the unhealthy climate, white men have been continually changed and removed, and are physically incapable of exercising a close supervision, so a policy of *laisse: faire* has been adopted. This applies also to the Government officials, whose only object appears to be to maintain the peace and escape annoyance. Europeans are treated as possible disturbers of the peace; they are practically at the mercy of the natives directly they move out of a coast town. Mining effort is severely handicapped at present; for though the native labourer can be obtained, his chief object is to cheat the white man because he knows he can do so with impunity. Any industry will also be much taxed by the expense of its white employees owing to the climate. There are large numbers of white men to whom this climate is not fatal or very injurious, yet they require six months' leave for every year worked. At a low estimate, the cost of white employees will be double what it is

elsewhere, and, in addition, the industry will suffer from change of management and lack of choice of employees. At the present time it is difficult to get enough competent men to go out to the country. White labour must continue to be exceedingly costly until some means are discovered of rendering the European immune to the ill effects of the climate. These remarks apply also to such industries as the growing of cotton, coffee, or other product which would have to compete on equal terms in the world's markets with those grown in other countries where the conditions of labour are more favourable. The country's greatest prospects are in gold, timber, and rubber.

THE PHILOSOPHY OF MAP-MAKING AND THE EVOLUTION OF A GREAT GERMAN ATLAS.

By J. G. Bartholomew, F.R.S.E.

Maps and Atlases may be said to be the epitomised record of our earth-knowledge, and, in their evolution, ought to reflect the progress of civilisation. As, decade after decade, the civilisation of the world advances, as the unknown is revealed and surveyed, as man alters the face of the earth with his new settlements, new states, cities, railways, canals, land-cultivation, reclamation, and exploitation, all these changes ought to be depicted in the atlases of the times. A modern commercial map of the world ought in fact to be a summary of international material assets.

For Geography is something more than discovery and exploration. In Modern Geography it may fairly be said that the British contribution is represented by *Search* and the German by *Research*. If the British have led the way in the discovery and exploration of the world, it is no less true that the geographical spirit has realised its greatest development in Germany. If the daring Briton has gloried in his instinct for enterprise and adventure, the studious, observing German has revelled in facts and research. While the British public rejoices in books of travel, adventure, and lighter literature, the German public studies and appreciates scientific results in standard works and elaborate atlases. Further, the Briton's conception of geography is essentially practical and commercial, he has an idea that trade will follow the Union Jack; accordingly he looks on colonies as branch establishments of the old country, but the German studies geography mainly for its own sake and for the knowledge and culture it brings him. Thus it is that geographical science has developed most in Germany, and practical colonisation has proceeded mostly from Britain. We usually see the characteristics of

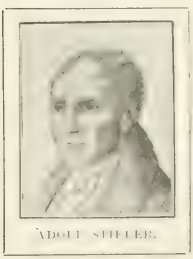
a nation reflected in its productions. The German wishes scientific maps, and he gets them; the average Briton of to-day only wishes, and can only understand, diagram maps, and he also gets them—for, with few exceptions, the demand determines the supply. To produce a scientific atlas in England at the present day is to embark on a daring philanthropic enterprise. For to the omniscient newspaper reviewer and to the man in the street, one map is as good as another, possibly better, if brightly coloured. Even on the part of our Government, our universities and educational authorities, the recognition and comprehension of geography is anything but encouraging. Progress is uphill work, for the difficulty is not simply the perfecting of an art but the education of the public mind to discriminate between good and bad. In Germany everything is very different; there we have a critical appreciation of merit in all its details—projection, uniform scales, physical relief, systematic treatment, accuracy, and technical excellence—so that the German cartographer is encouraged to produce his best with the certainty that the best will always be received with appreciation; and this is a great stimulus to progress.

Perhaps the first reason why map-making should have flourished in Germany is that in the middle ages it was re-born there and, in order to understand its development, it may be well to glance over the history of German cartography from the time of the Renaissance. To begin with, one may say that rational cartography was essentially founded on the work of the great Alexandrian geographer, Claudius Ptolemæus (127-151 A.D.), who was largely indebted to the labours of his predecessors, Eratosthenes, Hipparchus, and especially Marinus of Tyre. But, during mediæval times, Ptolemy's work lay dormant, and it was not until the Renaissance that it was made known by various Latin translations, illustrated with maps constructed from his data. At this time also the new arts of engraving on wood and copper were brought into use for the production of printed maps. The oldest printed map, one of Germany and western Europe, was produced in Germany from a wooden block about 1460. The revival of Ptolemy's methods led to the construction of maps on scientific principles. Places were now located by astronomical positions on a mathematically constructed projection, and henceforward progress in the recording of geographical facts was continuous. The earliest editions of Ptolemy were produced in Italy. The first German edition was by Nicolaus Donis and appeared at Ulm in 1482, illustrated with five new maps engraved on wood by Johann Schnitzer. Among the early cartographers of Germany was Martin Behaim of Nuremberg, who made his famous globe in 1492, immediately before Columbus discovered America. In 1507 Joh. Ruysch of Strassburg produced his well-known map of the world. In 1513 Joh. Werner of Nuremberg, who has the honour of being the first known professional cartographer, devised his equal area cordiform projection. From this time onwards, during the sixteenth, seventeenth, and eighteenth centuries the progress of discovery was rapid, and while Magellan, Davis, Tasman, Drake, Frobisher, Cook, and other Portuguese and English navigators were unveiling the mysteries of new lands and seas, German and Dutch

cartographers were busy at home mapping them. Among the most notable works of this period we may mention Schöner's Globes (Nuremberg, 1515, 1520); Gerhard Mercator's Map of the World (1569) on the cylindrical projection which now bears his name, also his Atlas in 1595; the Atlas of Ortelius, "Theatrum Orbis Terrarum," in 1570; W. Blaeu's Atlas Novus, in six volumes (1638), including a volume devoted to Timothy Pont's Maps of Scotland, followed by the Atlas Magnus of his son, Jan Blaeu, in eleven volumes. As the last of this epoch, and the connecting link with the next, Johann Baptist Homann of Nuremberg (1664-1724) is worthy of special mention. He engraved and published several atlases remarkable for beauty of engraving, and also brought out an Atlas Scholasticus, the first school atlas. With the close of the eighteenth century we come to a new era of great development in cartography—the period of national trigonometrical and geodetic surveys.

Hitherto the art of map-making had been a matter of private enterprise, but as the organisation of states developed, detailed topographical maps were now wanted for military and administrative purposes; and as these were beyond the field of private enterprise, state surveys were instituted. In 1750 France was the first country to undertake a general survey of the country at the expense of the state, and other governments rapidly followed her worthy example. Britain, as mistress of the seas, began to produce her great series of hydrographic charts. Coincident with the publication of land and sea surveys, the study of geography received a fresh inspiration from the geographical genius of Immanuel Kant, Karl Ritter, and Alexander von Humboldt, and, as a result of this great impetus, cartography was revolutionised. The ideals, the data, the technique, the appliances had all developed. Cartography now involved a rare combination of science and art, research and skill, patience and diligence, for its ideals were high and its possibilities unlimited.

At this opportune moment Adolf Stieler, at that time a secretary of legation and enthusiast in geography, joined forces with Justus Perthes, the publisher of the *Almanach de Gotha*, for the publication of a new atlas. It was evidently in no commercial spirit that they set to work, and this is truly characteristic of that famous publishing house, for all their work seems to have been inspired with the highest standard of excellence, and no expense spared towards realising it. No other private firm has ever been associated with so many distinguished geographers and cartographers, or rendered such great services to geographical science by its high-class works as Justus Perthes of Gotha. Stieler's Atlas first appeared in 1817, but it was not until 1831 that the first edition was considered complete in 75 maps. While these maps in accuracy, detail, and technical execution were very different from those in the Stieler of to-day, yet the work of Adolf Stieler in his first edition represented a striving after an ideal, realised by conscientious, pains-



ADOLF STIELER.

taking work in drawing, engraving, printing, and colouring, and the result was the best atlas of the times. The ideal from our present point of view was elementary, but to originate, to organise, to devise methods and carry out such a work from its very beginning is much more difficult than to improve upon a working organisation, and considering that Stieler was a self-taught cartographer, it is wonderful what he achieved. After the death of Stieler in 1836 the next two editions, 1845-47, and 1852-54, were produced by his assistant and successor, Friedrich von Stülpnagel. Over thirty new maps were drawn by him, and by his unflagging industry he worthily maintained and added to the high reputation of the Atlas.

F. VON STULPNAGEL.

The great transformation in the development of Stieler was achieved by the cartographic genius of Augustus Petermann, who came to Gotha in 1855. With an able staff of draughtsmen and engravers under his skilled direction, a new era in atlas cartography was inaugurated, and Stieler attained its highest fame. Petermann had, to begin with, the great advantage of special training as a cartographer under Professor Heinrich Berghaus of Berlin, who was then engaged in the preparation of his famous Physical Atlas. For some time Petermann was in business as a cartographer in London, and in constant contact with the Royal Geographical Society and all its schemes. The filling up of the blank spaces of the unknown on his maps had such a fascination for him that rest seemed impossible to him while any country remained unexplored. His zeal in promoting the exploration of distant lands was indefatigable, and he even sent out a small Arctic expedition at his own expense. Perhaps he was so keenly interested in far-off lands that he somewhat neglected the mapping of European countries, but, fortunately for the Atlas, he had as a colleague the able cartographer, Carl Vogel, whose special genius was for topographical maps. Instead of the more or less bald political maps, Petermann's drawings were geographical pictures showing the physical relief and land surface features as a basis for all other information. It may be said that hitherto this was impossible, as the data were not available; but now the contributions of travellers and explorers, under the direction of geographical societies, were of a more reliable and scientific character, and Petermann came on the scene at the opportune time, knowing how to take advantage of them. It is only a fair tribute to Augustus Petermann to say that no one has done more than he to advance modern cartography, and no man has ever left a more fitting monument to himself than his *Mitteilungen*, which still bears his name, and under the editorship of Dr. Supan, is the leading

AUGUSTUS PETERMANN.

CARL VOGEL.

geographical authority in all countries. But to the absorbing fascination of his work Petermann sacrificed all other interests in life and died a martyr to geography.

Petermann left behind him a well-organised staff of draughtsmen and engravers eminently qualified to continue his work, and the seventh (1877-82) and eighth (1889-92) editions were brought out under the direction of Berghaus and Vogel. Hermann Berghaus, the nephew of Heinrich Berghaus, and the renowned editor of the second Berghaus Physical Atlas (1883-91), was not so directly identified with Stieler as its former editors, but during his connection with it he was responsible for the physical and general geographical maps, while Carl Vogel devoted himself to his beautiful topographical maps of the European states. These were the men of the nineteenth century Stieler. To-day they are all gone, but their ideals remain.

HERMANN BERGHAUS.

Now, at the beginning of the twentieth century, the conditions and possibilities of cartography are much changed—they are at once more difficult and more encouraging. Almost the whole of Europe has been mapped in beautiful and elaborate detail, land surveys, sea surveys, and scientific observations are in active progress in all parts of the world, and geographical data has so greatly increased that now a single day brings as much new map-making material as one would get in the course of a year a century ago. The minds of contemporary geographers are also active and prolific. Thus the cartographer's difficulty is to keep pace with the new material, the magnitude of which may be somewhat realised if one considers that in a modern atlas we have a representation in miniature of perhaps a hundred thousand original survey sheets. But while the work of compiling and engraving is much heavier, technical methods have also developed, and the application of photography and lithographic printing has facilitated rapid production. The demand that once was limited is now general, although cheap imitations often deprive the original worker of his just reward. Popular atlases sell in large numbers, yet the demand for scientific works of a higher class is so limited that they are seldom produced without a loss.

Under new conditions we have a new Stieler. People had begun to think that its day was over. Rivals had appeared in the field, and the beautiful atlases of Andree and Debes, with their newly constructed maps, and cheaper on account of newer methods of production, were deservedly popular. But now Stieler has again renewed its youth, and appears in its ninth edition as practically a new atlas. Judging from the printed contents and the maps of the Eastern Alps and China, in the first part now before us, it bids fair to leave its predecessors far behind. The leading characteristic of these maps is the very effective treatment of the physical relief. The hills are separately engraved and printed in brown with a shadow tint, thus giving the effect of a relief model on which the topographical and political features are superimposed. The map of the Eastern Alps, by C. Scherrer and H. Habenicht, on the

scale of 1 : 925,000, is a piece of work for which they deserve the highest credit. The map of China, by C. Barich, on the scale of 1 : 7,500,000, is in the same style, but presents a more difficult subject for effective treatment. It is only justice to these cartographers, as well as to the engravers and printers who have reproduced their work, to say that these are perhaps the finest specimens of atlas cartography yet achieved in any country. To the appreciative eye, each map is a geographical picture, a compendium of knowledge, and an exact scientific document. We heartily congratulate the publishers on the result. As to the rest of the Atlas, the prospectus states that of the 100 maps, 49 are entirely new, while the others have been revised and the hill engraving separated from the lettering, so that it may be printed in brown, after the style of the new maps.

In conclusion, one may say with some truth that, if the Germans are conservative in politics, they are liberal in science and art, for an educated aristocracy rules in Germany. If the British are liberal in politics, they are conservative in science, for a half-educated democracy rules the British Empire. The one condition is favourable to cartography, the other unfavourable. British cartographers have to contend with many adverse conditions which do not exist in Germany, but nevertheless, from time to time, they have shown that they can produce the highest class of maps. In the present degenerate days, when cheapness is appreciated more than merit, there is little encouragement to produce high-class work, but we may hope that this is only a transition stage, and that the mind of the masses will yet be leavened with philosophy. Every advance towards perfection in cartography helps towards a comprehension of the synthetic unity of the Cosmos, towards the solution of the problems of living, towards the realisation of the most desirable conditions for the evolution of moral and material welfare in this world. An atlas is truly a Cosmoscope for those who know how to use it.

PROCEEDINGS OF THE ROYAL SCOTTISH GEOGRAPHICAL SOCIETY.

Meeting of Council.

At a Meeting of Council held on 20th December, the undermentioned gentlemen were elected Members of the Society:—Thomas Downie, Robert Gray, Brigade-Surgeon, William Kerr, Alfred Ernest Maylard, M.B., B.S., J. Petersen, William Henry Ross, A. Blake Scott, John G. Sinclair, Robert Story, Anderson Turner, Councillor D. E. Young. The further proceedings of this meeting will be reported next month.

"Hints to Travellers."

The Royal Geographical Society has consented to supply *Hints to Travellers* to members of this Society at the price (10s.) paid for the

work by its own Fellows. Members wishing to obtain the book should apply, with remittance, to the Secretary, Royal Geographical Society, 1 Savile Row, London, W.

Meetings in December.

On 4th December Professor Norman Collie, F.R.S., addressed the Society in Edinburgh, on the subject of his explorations amongst the Canadian Rocky Mountains. The Chair was taken by Mr. H. M. Cadell. Professor Collie repeated his address at Glasgow on the 5th, when Mr. W. F. G. Anderson presided.

On the 17th Mrs. Archibald Little addressed the Aberdeen Branch on the Gorges of the Yangtse. The Chair was taken by Mr. Spence. Mrs. Little repeated her lecture in Dundee on the 18th, when the Chair was occupied by the Rev. Colin Campbell, D.D.; and in Edinburgh on the 19th, when the President of the Society, Sir John Murray, presided.

GEOGRAPHICAL NOTES.

EUROPE.

The Hungarian Plain.—M. L'Abbé L. de Lagger gives an interesting account of an excursion to this plain made by a party of students from Vienna under the leadership of Professor Penck and M. Lóczy.

The plain is bounded on the west and south by the Danube, and on the north and east extends up to the mountains of Transylvania and the Carpathians. It is divided into two nearly equal parts by the Tisza, and it was to the western part that the excursion was made. The local name for the plain or Alföld is "puszta," but this merely means a region destitute of human habitations, and is not a descriptive term. The region is not to be regarded as of the nature of a steppe, for, though the soil is mediocre, the climate is good, and suited not only to the cultivation of cereals and potatoes, but also to maize, the vine, and fruit-trees. Two distinct types of soil occur in the area—(1) sands of eolian origin, and (2) alluvium due to river-action. The former occupies the intervals between the valleys, and owes its origin to the action of wind on the deposits of the seas which occupied the area in Miocene and Pliocene times. To the area covered by these sands the author applies the North German name of *Geest*. In the geests numerous sand-dunes occur, and between them the soil is covered with innumerable brackish ponds, due to the removal over certain areas of the superficial sand and the exposure of the underlying clay. The alluvial deposits are confined to the extensive valleys which penetrate the plain, and which are traversed by meandering streams. It is these valleys which are best suited for the purpose of the agriculturist. The inhabitants of the plain live in large villages, which, though they may possess a population varying from two to six thousand persons, are yet structurally villages or groups of farms, and not towns. These collections of farms are separated from one another by distances of thirty to fifty kilometres, and owe their existence and characteristic form to the Mussulman invasions of the period before the seventeenth century. By the middle of June, these villages are almost deserted save for the old men and the women and children. The remainder of the population has migrated out into the plains to harvest the crops or to pasture

the flocks. Indeed, the author notes that the inhabitants display at once the three stages in the development of the agriculturist; in the plains are seen the temporary shelters of the nomadic herdsmen, nearer the villages the summer residences of the semi-nomadic farmer who crops his land only during the warm season, and within the villages the permanent homes, comparable to the farmsteads of the western farmer. In consequence, each village is surrounded by, as it were, a double zone of land: first the gardens and orchards cultivated from the permanent dwelling, then the wider zone of fields containing the summer dwellings, while around all is the vast uncultivated puszta. The colonisation of this wide area is already beginning, and as it spreads the pastoral nomadism must yield place to the agriculture of the west. The progress of the latter would be more rapid were it not for the difficulty of means of communication, the roads being bad and materials for road-making scarce or absent. A system of railways and of canals would, the author believes, lead to a great increase in the prosperity of the plain-area. At Miklos the school of agriculture has obtained good results by a system of deep-trenching and levelling, which leads to a great increase in the fertility, and is remunerative if the land so treated be devoted to the culture of vines or fruit-trees.—*Annales de Géographie*, x. (1901), pp. 438-44.

Meteorology of Moscow during 1900.—Professor Ernst Leyst publishes a very full report on this subject, comparing the results obtained with those of preceding years. The most prevalent wind is the north-west, registered on 174 occasions, and next to it in frequency comes the south-east, registered on 151 occasions. Calms occurred most frequently in August, least frequently in December and January. In regard to temperature, high atmospheric pressure produces a fall in the winter months, while low pressure has the same effect in summer. Taking the observations for the last eight years, it appears that July is the only month during that period in which no frost is recorded, in all other months the minimum temperature has fallen below zero. April is the month in which there is the greatest variation of the maximum temperature, while in the winter months, especially February, there is the greatest variation of the minimum. The maximum for January varies from +4·6° C. to −8·7° C., the minimum from −19·6° to −33·2°, while in July the range is much less, the maximum varying from 35·0° to 29·8°, and the minimum from 9·5° to 5·4°. In other words, the difference between the winter extremes is three times as great as between the summer. In 1900 the total yearly range of temperature was 69·9 (maximum +32·9, minimum −37·0), greater by 3·4 than any range known in the last eight years, but it was preceded in 1899 by a range of only 55·8°, the lowest known during the same period. During 1900 no frost was experienced in June or July, the last spring frost being on May 13th, and the first autumnal on August 30th.—*Bulletin de la Société Impériale des Naturalistes de Moscou*, for 1900, pub. 1901, pp. 397-432.

Fauna of the Caucasus.—N. J. Dinnik, during the year 1900, made a series of excursions in the Russian provinces of Kars and Erivan in order to study the distribution of the large mammals over the Caucasus mountains. On the military Georgian highway, deer occur on the northern side at Vladikavkas and Balta, and on the southern side at Ananour (height 2235 ft.) and below, but they rarely ascend to Passanaour (3627 ft.). The goat *Capra pallassii* occurs only on the mountain Kasbek and the neighbouring hills, while the chamois is absent from the Kasbek, but occurs near Sion Kobi, on the Krestovoi, and not far from Vladikavkas. Jackals occur near Mzkhet, Zilkany, and rarely near Ananour. Bears are found in the forests near Vladikavkas, and on the southern slope beginning at the station of Mlety. On the elevated regions of the highway a dark-coloured fox (*Vulpes*

melanotus) occurs. In the wooded country of Karaklis at a height of 3800 feet there are deer, wild goats (not *C. pallasii*), many bears, and occasionally chamois, the last being commoner in the gorge of Akstapha, near Djarkhetchi. It is a remarkable fact that the wild boar is rare or absent, partly, no doubt, because of the altitude and the enormous accumulation of snow in winter. Generally speaking, the more elevated regions are poor in animals, and this is especially the case where the hillsides are not wooded. In the district of Nakhitchévan the sheep *Ovis gmelini* occurs. In the forests round Borjom, where hunting is prohibited, there occur many red deer, the roe deer, bears, boars, lynx, the wild goat (*C. pallasii*), and introduced fallow deer. The fallow deer of the northern Caucasus, *Capreolus pigargus*, is absent.—*Bulletin de la Société Impériale des Naturalistes de Moscou*, for 1900, pub. 1901, pp. 509-11.

ASIA.

Jebel Akhdar Mountain of Oman.—Colonel S. B. Miles describes a journey of exploration undertaken across this range, the Green Mountain of the Arabs. His itinerary was briefly as follows. Starting from Muskat he took boat to Sib, thence following the coast he travelled northwards to Burka. From Burka he struck inland in a southerly direction across the maritime plain of Batina, which is largely an uncultivated desert, and ascended the Nakl range to the town of that name. From this town the party travelled over a barren country to Akabat el Hajar, a steep pass up the Jebel Akhdar, which is crossed by a bridle path largely built of stone slabs, and showing remarkable skill in construction. From the summit the party journeyed onwards to the village of Saik, which lies in a rocky cleft, and is reached by a rocky staircase, down which the sure-footed pack-asses make their way. From Saik the party travelled to the larger village of Sheraizi; thence by the rugged and precipitous Wady Miyadin the descent was continued downwards to the extensive plain round the town of Birket el Muz. From this point the party travelled eastwards to Zikki, and then turning north they ascended to the summit of the ridge at Nejd Beni Rowaiha, which is the lowest point of the Jebel Akhdar range, and so commanded a view of the fertile valley of the Wady Beni Rowaiha, which stretches from this point to the sea. Down the Wady the journey was continued to Semail, and ultimately back to Muskat.

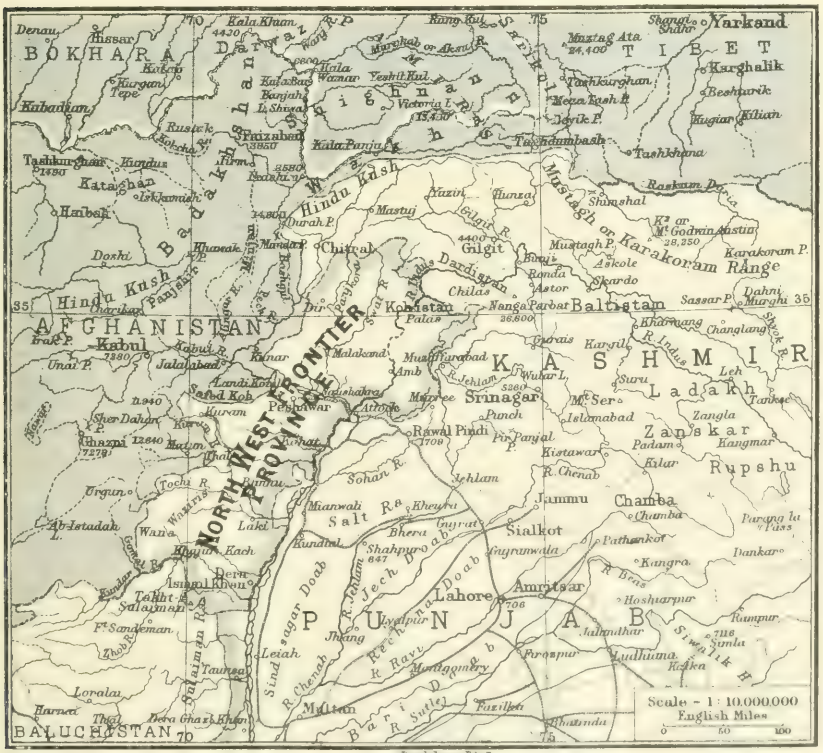
The chief observations made may be summarised as follows. Throughout the Jebel Akhdar the soil is dry and porous, although fountains are numerous, and irrigation is in consequence extensively practised. As evaporation is rapid in the hot sun, the irrigating streams are conveyed underground, in what are known as *feleje*. These are constructed in the following way. Near some, perhaps distant, spring at the foot of a hill a circular shaft is dug, about 4 to 5 feet in diameter and perhaps 30 to 40 feet in depth. Similar shafts are constructed at successive intervals of 100 to 150 feet, growing shallower as they near the village, and these shafts are connected by an underground conduit, so arranged that the water approaches the surface at the village. When irrigated in this way the soil becomes fertile, and produces grapes, apricots, pomegranates, figs, corn, melons, and so on. At Sheraizi there are remarkable pensile gardens and orchards, formed by terraces cut out of the hillside in parallel series, and carefully irrigated by streams of water made to pass from one terrace to the next by means of embankments. In this village also the grapes are not only eaten fresh and dried as raisins, but are also made into an inferior kind of wine, the inhabitants being Persians and noted among the abstemious Arabs for their wine-drinking habits.

The mountain of Jebel Akhdar is estimated as extending thirty miles in an

east to west direction, with a breadth of fourteen miles. Its steeper slope is that facing the sea, up which ascends the Akabet el Hajar pass. On the southern side there are two longer ravines, down which flow the two main rivers, the Wady Miyadin and the Wady Tanuf. Though now bare of vegetation over a large part of its surface, the Arabian name (Green Mountain) points to a time when the surface of the mountain was more fully clothed. If minerals exist, they are not worked by the inhabitants, who are farmers or shepherds. Wild animals are few, but wolves, hyenas, wild goats, ibex, lynxes, wild cats, and more doubtfully leopards, are said to exist.

In Nakhl, a town in the range of the same name, thermal springs occur, and are greatly esteemed by the inhabitants for their curative properties. The author found the hottest to have a temperature of 106° F. ; none of the others exceeded 104° F. In this town, as in Semail, cloth-weaving forms an important industry. At Semail, which is far down the valley, dates are extensively grown, especially the "Fard" variety, which are sent to the Muskat market for export. — *The Geographical Journal*, xviii. (1901), No. 5, pp. 465-98, 1 map.

The new North-West Frontier Province of India.—It is understood that the *raison d'être* of the new frontier province in India, of which we reproduce a



SKETCH-MAP SHOWING THE LIMITS OF THE NEW "NORTH-WEST FRONTIER PROVINCE OF INDIA."

sketch, was the decision of the Imperial Government to retain in its own hands the direction of the frontier policy, which up to lately had been in the hands of the

Government of the Punjab. As the new province is now constituted, the Chief Commissioner will be under the direct control of the Foreign Secretary in Calcutta and Simla.

AFRICA.

Geology of Transvaal. M. G. A. F. Molengraaff has published a memoir on this subject, illustrated by a map and figures. The basal rocks throughout are stratified beds of primary age, possibly Precambrian or Silurian, traversed by intrusions of granite, and much folded and fractured. The auriferous deposits occur throughout these beds in quartz veins filling up the fissures of the rocks, and are consequently most abundant in the regions where faults are most frequent (cf. the mines of Barberton and Lydenburg). Quite different from these are the gold-bearing conglomerates of the Witwatersrand, which are local deposits present in the S. and SW. of the Transvaal. Upon these basal rocks the Cape beds rest unconformably, and upon them, again unconformably, the Karoo beds. These are divided into an upper and lower series, of which the latter consists of the Dwyka conglomerates and the Ecca beds. M. Molengraaff has completely proved that, as was suggested by Sutherland, the Dwyka conglomerates are glacial moraines of Permian age. The Ecca beds are comparable to the diluvial loess of Europe, and were laid down in the lakes formed during the retreat of the glaciers. Further, the Gondwana system of India is quite comparable to the inferior Karoo beds, and is almost certainly contemporaneous with the latter and with the glacial deposits of Permian age in Australia. The superior Karoo beds lie almost horizontally, they are of economic value, in that they contain deposits of coal, and are apparently lacustrine deposits, formed after the close of the Permian glacial epoch.

Above the Karoo beds there are only superficial deposits of agricultural but not of geological value. Thus South Africa is to be regarded as an exceedingly old continent, which has never been submerged since primary times. *Bull. Soc. Géol. de France*, i. (1901), pp. 13-92, 19 figs. and 2 plates. See also *Annales de Géographie*, x. (1901), pp. 450-53, 1 plate.

Navigation of Lower Niger. Captain Lenfant, with a party conveying twenty barges loaded with provisions and tools, has successfully ascended the Niger from Géba to Say. The party left Géba on March 25, and found that the ascent was exceedingly difficult owing to the fact that the river was more than usually low and the vegetation of the banks particularly dense. In spite of these difficulties the rapids of Ourou, Patassi, and Garafiri were successfully traversed, and the party arrived at Gaya on May 7 without having sustained loss of any kind. Thence the journey was continued to Say, which was reached in safety. The expedition is of considerable importance, and it appears that the difficulties would be greatly diminished if the river were ascended when the usual depth of water was present. *Annales de Géographie*, x. (1901), pp. 473-74.

Malaria Campaign in Sierra Leone. Major Ronald Ross describes the results already obtained in connection with the attempt to reduce malaria by destroying the breeding-places of the mosquitoes. In the first place, the efforts of Major Ross and his colleague, Dr. Logan Taylor, were directed only against the mosquito *Anopheles*, which it has been proved is the agent of malarial infection, but later it was resolved to attack all mosquitoes, as other forms undoubtedly convey the dangerous parasite *Filaria*, and also the germs of yellow fever. The methods consisted in destroying, as far as possible, the breeding-places, especially pools of

stagnant water, and old tins, and vessels of all sorts. Where complete drainage proved impossible, the pools and puddles were treated with oil or creosote. So far the results seem to have been satisfactory, a considerable reduction in the number of mosquitoes being apparent in Freetown. Similar work is to be carried on in the chief towns of the Gold Coast.—*Report of the Campaign against Mosquitoes in Sierra Leone*, Liverpool, 1901.

Filariæ in Nigeria.—Drs. H. G. Annett, J. Everett Dutton, and J. H. Elliott describe a number of observations made in West Africa on birds and man, having for their object the study of the parasitic worms of the genus *Filaria*, one species of which produces the widely distributed tropical disease elephantiasis. The worms are conveyed to man by the agency of mosquitoes. The result of the research is a valuable contribution to knowledge on the subject of *Filaria*, and also a description of the mouth-parts of the mosquito, and the mechanism of biting.—*Report on the Malaria Expedition to Nigeria*, Part II., *Filariasis*, Liverpool, 1901.

AMERICA.

Sex, Nativity, and Colour of Inhabitants of the United States.—The census of 1900, as contrasted with that of 1890, shows that in the United States the females are increasing in proportion to the males, the native-born in proportion to the foreigners, the whites to the negroes. In 1890, of every 10,000 inhabitants 5124 were males and 4876 were females, in 1900 there were 5118 males in every 10,000, and 4882 females. In 1900, 863 persons out of every 1000 were native born, in 1890 only 852 out of every 1000 were native born. In every 1000 of the population there are now 116 negroes or persons of negro descent, 3 Indians, 2 Chinese, 1 Japanese, and 878 whites. The negro population in the ten years shows an increase of 18·1 per cent., as against the 24·4 per cent. increase for the whites. In regard to the origin and distribution of the foreign element, some interesting facts are disclosed by the census. Of every 1000 increase of foreign born, 801 are concentrated in the six New England States and in New York, New Jersey, and Pennsylvania, whereas in the previous decade the states of the North Central division—Ohio, Indiana, Illinois, Michigan, Wisconsin, Minnesota, Iowa, Missouri, the Dakotas, Nebraska, and Kansas—received the greater part of the increase. But even in the North Atlantic division there has been a considerable diminution in the increase of foreign born, as compared with the previous decade. There has also been a gradual change in the nationality of the immigrants.

In 1860, Canada, Germany, Great Britain, Ireland, and Norway and Sweden contributed 90·4 per cent. of all the immigrants, while Austria-Hungary, Italy, and Russia and Poland contributed only 1·1 per cent. In 1880 the first group contributed 81·7 per cent., and the second 6·4 per cent.; in 1890 the first 73·9 per cent., and the second 17·6 per cent. In the last ten years this change has been continued further, and the second group furnished quite half the immigrants. Poles, Italians, and Hungarians are extensively employed as labourers in mining districts and manufacturing towns, and are stated to be ousting the Irish from this kind of work. During the past ten years three and a half millions of immigrants have entered, but as the total increase of the foreign born is only about one million, it is obvious that many of the immigrants have again quitted the country, probably after only a short stay. In the past ten years the Chinese and Indians have decreased, but the Japanese have increased more than tenfold, the numbers being 2039 in 1890, as against 24,326 in 1900.

As regards the distribution of males and females in the States, the sexes over

the whole area are rather more evenly balanced than in 1890. There are eleven States where there are more females than males. In Massachusetts the excess of females is 70,398, in New York 39,334, in the District of Columbia 14,710. In Pennsylvania there is a male majority of 106,967, due largely to the foreign born element. In Montana, Wyoming, and Nevada occurs the largest excess of males, which there form 60 per cent. of the entire population. Only among the negroes is there an absolute excess of females, for there are 54,347 more females of negro descent than males.—*National Geographic Magazine*, xii. (1901), No. 11.

GENERAL.

High Tides on English Coast.—On November 28 last, exceptionally high tides were recorded at various parts of the east coast. In the Thames the water rose about three and a half feet above the ordinary level, flooding the footpath of the embankment to the extent of ten to twelve inches. At Ipswich the rise was four to five feet above the average, while at Yarmouth it was eight feet above. In the Ouse the tides are stated to have been higher than any described during the past twenty years, and resulted in very extensive flooding in the vicinity of Goole.

At the Meeting of the Royal Geographical Society on November 25, Dr. Vaughan Cornish exhibited a successful kinematograph of the Severn bore. This is apparently the first time that the movements of tidal waves have been represented by photography.

At the Zoological Society on November 19, Professor G. Ray Lankester read a paper on the okapi, the interesting new mammal discovered by Sir Harry Johnston in West Africa. Its nearest living ally is certainly the giraffe.

Ordnance Survey of Scotland.—Publications issued from 1st to 30th November 1901 :—Parish Maps (Scale 1 : 2500, Revised, with Houses ruled, and with areas, Price 3s. each). *Aberdeenshire.*—Sheets x. 16 ; xi. 10, 11, 12, 15, 16 ; xii. 15, 16 ; xix. 1, 2, 5 ; xxviii. 1 ; xxxiii. 7, 8, 10 ; xxxiv. 9 ; xlii. 8 ; xliii. 1 ; lii. 9 ; lx. 4, 8, 12, 16 ; lxix. 4 ; lxxv. 10, 12, 14, 15, 16 ; xc. 6, 9 ; xci. 3, 4, 5, 6, 8, 9, 10, 11, 12, 13, 14, 15. *Forfarshire.*—Sheets xxxvi. 2, 16 ; xxxvii. 1, 5, 13 ; xliii. 1, 9. *Inverness-shire.*—Sheets xlvi. 8, 10, 11, 13, 15 ; lviii. 12, 16 ; lix. 9 ; lxxiii. 3, 4, 11, 15. *Orkney.*—Sheets lxx. 15 ; lxxv. 1, 5, 6, 7, 10, 11, 12 ; lxxviii. 9 ; lxxix. 2 ; lxxxii. 14. *Perthshire.*—Sheets liv. 9, 13 ; lxv. 1. Note.—There is no coloured edition of these Sheets, and the unrevised impressions are withdrawn from sale.

One-Inch Parish Indexes. Printed in colours in two forms, one showing the 1 : 2500 Scale Maps and the other the six-inch Sheets. Sheets 124, 130 ; Price 1s. 6d. each. Printed in colours showing the six-inch Sheets. Sheet 123 ; Price 1s. 6d. Printed in colours in two forms, one showing the 1 : 2500 Scale Maps and the other the six-inch Quarter-Sheets. Sheets 47, 48 ; Price 1s. 6d. each.

County Diagrams. Scale, four miles to one inch, showing civil parishes with a table of their areas and the numbers of their one-inch indexes. Argyllshire, (North Part) ; Price 6d. Argyllshire (South Part) and Buteshire ; Price 6d.

Six-inch County Maps—Revised. *Aberdeenshire.*—Sheet (104 and 103A) ; Price 2s.

Six-inch Maps (Quarter Sheets—Revised). *Perthshire.*—8 SW. ; 15 (NW. and NE.), 15 SE. ; 24 (SW. and SE.) ; 112 SE. ; 121 NE., 121 SE. ; Price 1s. each. With Contours ; Price 1s. each. *Aberdeenshire*—15 SW. ; 38 SE. ; 45 NE. ; 66 SW. *Perthshire.*—86 NE. ; 98 NE. ; 109 SW. ; 129 NW.

Inhabitants of Pitcairn Island.—Dr. Rudolf A. Hermann publishes an exceedingly interesting summary account of the history of the mutineers of the *Bounty*, which though not containing anything new, may be welcomed as a concise summary of the literature of the subject. The paper contains a good bibliography, and the present instalment deals with the history of the islanders from 1800 to their migration to Norfolk Island in 1856, the object being to seek in their past history for the cause of the degeneration which appears now to have befallen the islanders.—*Petermann's Mitteilungen*, xlvii., 1901, x.

School of Geography at Oxford.—The arrangements for the Hilary term have been completed, and comprise the following courses: Lectures on "The Historical Geography of Europe," by Mr. Mackinder; on "Map Projections," "The Climatic Regions of the Globe," and "Military Topography," by Mr. Dickson; on "The Regional Geography of Continental Europe," "The British Isles," and "Types of Land Forms," by Mr. Herbertson; on "The Topography of Greece in relation to Herodotus and Thucydides," by Mr. Grundy; on "The Period of the Great Discoveries, 1486-1650," by Mr. Beazley.

French Newfoundland Fisheries.—The fishermen who annually leave France for the coast of Newfoundland to fish for cod are now beginning to return home. During the year 1901, 222 fishing-boats and 6700 fishermen left France, whose "Colonie de Sainte Pierre et Miquelon" had equipped 202 schooners manned by 3600 men. Besides this, 600 to 700 young Bretons emigrated to St. Pierre to work at the drying of the cod during the fishing season; so that, in all, there were 11,000 Frenchmen engaged.

Going out to Newfoundland, the French boats are sailed by their crews, but the men of the St. Pierre schooners, as well as the "graviers," are conveyed in large French steamships, as many as 1200 or 1300 men being in one steamer. Returning to France, all the fishermen sail in fishing-boats, some three-masted ones, with crews of 30 men, picking up as many as 150 or 180 fishermen at St. Pierre. Owing to their insanitary quarters, crowded with men and codfish, their wretched food, and their large consumption of bad spirits, the home-coming fishermen have often deplorable voyages. It is much to be desired that they should be conveyed home in special steamers, that they should have good food and sanitary quarters on board, and that the supply to them of abominable spirits should be interdicted.—Th. Janvrais in *Le Figaro* (Paris), 6th Dec. 1901.

COMMERCIAL GEOGRAPHY.

New Line of Steamers from Buenos Aires to Patagonia.—Mr. A. A. G. Dobson, a corresponding member of the Society, informs us that on October 14, 1901, the opening of "La linea nacional de navegacion al Sur" was inaugurated by a breakfast, at which President Roca was present. On the same day the ss. *Comodoro Rivadavia* left for Patagonia with 120 passengers and 1500 tons of cargo.

Canadian Terminus of Pacific Cable.—The landing stage of the Pacific cable in Canada is to be at Barclay Sound, on the west coast of Vancouver Island, in a practically landlocked harbour. About the first of January a steamer will leave London with the section of the cable to be laid from Fanning Island to Norfolk Island, and from Norfolk Island to Australia and New Zealand. About six months later a second steamer will leave London with the cable for the long stretch between Fanning Island and the landing station on the west coast of Vancouver Island. The cable is to be all-British, and direct connection will be made with

the Canadian Pacific Railway Company's telegraph at Vancouver by means of that company's cable across the Gulf of Georgia.—*The Canada Gazette*, xxxviii. (1901), 28th Nov.

New Jute Seaport for France.—La Pallice, near Rochelle, has been selected for the importation of jute destined for the manufactories of the west and centre of France, which were formerly obliged to supply themselves almost exclusively from London. Several jute-laden steamers from Calcutta have already discharged their cargoes at La Pallice.—*Le Figaro* (Paris), 28th Nov. 1901.

French Migration Townwards.—The agricultural community in France is greatly disturbed by the continually increasing migration of the population to the towns and manufacturing centres, in consequence of the difficulty of securing a livelihood by the cultivation of the soil. For the past twenty years growers of corn have had a disastrous experience. To this is now added a crisis in the cultivation of vines which has overwhelmed the whole southern region of France.—*Le Figaro* (Paris), 28th Nov. 1901.

New Canadian Enterprise.—A practically inexhaustible field of iron ore having been found to exist at Sault Ste. Marie in Canada, at the eastern outlet of Lake Superior, a powerful English corporation proposes to open it up and to greatly increase the world's supply of steel and iron manufactures. Works are already in course of erection, and it is intended to construct sixteen mills for the manufacture of steel tubes alone under a special patent. By utilising the water-power it will be possible to turn out armour-plate, steel rails, and other descriptions of goods of the same class at extremely low prices. The Dominion Government has undertaken to make such improvements in the St. Lawrence river, and so to deepen and light its channel that vessels may be able to ply from Sault Ste. Marie with safety and despatch. A subsidy of £150,000 per annum will also be paid to an English Steamship Company, which will carry the output of the Sault Ste. Marie works to the markets of the world.—*Joint-stock Companies Journal* (London), 27th Nov. 1901.

A new British cable has been laid between South Africa and Australia. When connected with the Canada and New Zealand cable, now in construction, there will be all-British telegraph communication right round the world.

A railway is to be constructed from Suakin to Berber which is expected to conduce materially to the development of the Sudan.

The administrations of Uganda and British and German East Africa have decided to put a stop to the use of cowries as a currency. Being of no intrinsic value, the Government will not accept them from the natives in payment of the hut tax.

On Lake Nyasa there are at present six steamers and steam launches; on the Upper Shiré, six steamers, twenty-one barges, and two dhows. One steamer and one sailing-boat are at present building for the lake.

The United States Isthmian Canal Commission have decided on the Nicaragua Route. They estimate that the canal by that route may be completed in six years at a cost of about £40,000,000.

According to the most recent estimates, the total population of the British Empire at the beginning of the century is about 400,000,000. Of this total about 49,000,000 are British or of British descent, about 4,000,000 are of European nationality other than British, and 347,000,000 are Native Races Blacks, Asiatics, etc.

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The Federal High Court of the United States has come to the decision that the Philippine Islands must be considered United States territory, consequently no duties on goods of American origin can henceforth be levied.

An important discovery of coal has been made in Ecuador on the railway between Quito and Guayaquil.

The total population of the Australian Commonwealth was given last month as 3,775,356, while that of "Greater London" in March was 6,580,616.

The Cape Government has started an "Information Bureau" at Cape Town, where new arrivals may be supplied with information regarding farming, industry, or trade in any part of the Colony.

NEW BOOKS.

Armenia: Travels and Studies. By H. F. B. Lynch. In two vols. Vol. I. The Russian Provinces. Vol. II. The Turkish Provinces. London: Longmans, Green and Co., 1901. Pp. vol. I. xv + 470; vol. II. xi + 512. *Price* 42*s*.

This is a notable book. For all true lovers of science, of nature, and of their kind, it is in many respects a perfect book. It is not only an honest record of hard work, it is also a monument in itself of exact learning in many departments. It is magnificently got up. The way in which the numerous carefully drawn maps and sketches and beautiful photographs are used to elucidate, not merely to fill up gaps in, the letterpress, is admirable. Being well equipped himself, the author has been able to marshal his materials derived from former investigators and writers, and from his own observations in such a way as to warrant our opinion that this is likely to be a standard work on Armenia for a long time to come. The author is an ideal traveller, resourceful, firm, humane. He has no long list of personal ailments and breakdowns in programme to catalogue, as is the wont of so many travel-writers in seeking to pose as martyrs to the cause of enlightenment. The absorbing interest of the object he pursues eliminates the personal element, to the great gain of the reader. And yet his minute and faithful details of descriptions, topographical, archæological, and other, are pleasantly relieved by many a personal episode and incident of travel. Perhaps because he is so bent on solid achievement, and perhaps also because he has made copious use of illustrations, he does not seem to rise as high as he might as a descriptive writer. Still, he has the distinct vein, his general style has no lack of animation, and the book has many passages of uncommon beauty. To cite a few instances: his accounts of his "rousing the drowsy East" to get him horses for the ascent of Mount Ararat, of what he saw and felt on that famous mountain, his camping with the cavalry and zaptiehs inside the gigantic circle of the Kurd- and bear-infested Nimrud crater, are clear, vivid, and realistic. It is doubtless as a student he does his best work. He goes into it with full knowledge and exact terminology, and has given us a valuable contribution to the scientific knowledge of Armenian land and peoples. But there is a note he sounds higher than his scientific work, higher than that reached by most travellers, and that is his profound feeling for Nature. This explains at once his success in dealing with Orientals, and his fair estimate of creeds and peoples. The persistent way in which, through the

multitude of stiff details, he makes the reader feel the pulse and throb of the vast incorruptible *Natur-Geist*, while some may explain it as the Spirit of the East weighing on him, and some may call it mysticism and some pantheism, is nevertheless one of the best and truest features of the book.

It would be tedious to review in detail all the interesting ancient and mediæval sites he has examined, and all the plains, valleys, mountains, and rivers he has delineated. Suffice to say that so clear and methodical is his handling of this vast and intricate subject, that we may conveniently indicate his results (in these two big handsome volumes, the first treating the Russian, and the second the Turkish province) in three groups :—

I. Geographical and Geological.—A zone of elevated country, a series of tablelands, stretches across the Asiatic continent from the Pacific to the Mediterranean, flanked on the north and south by great chains of mountains forming extensive arcs of varying curvature. Armenia is such a tableland. In Western Asia the chains thus enclosing the tablelands are disposed in two roughly parallel series of arcs bulging towards the south. These chains, or peripheral mountains, have been formed by lateral pressure from the north causing a folding of the earth's crust; but in one or two places (as in Hindu Kush and Armenia) an opposing pressure from the south has brought the two peripheral margins close to each other, producing great orographical variety. In Armenia this compression of the arcs is most marked in the country lying between Trebizond and Diarbekr. To this cause is also due the intrusive digression, from the outer or southern arc, of the vast Ararat system or Aghri Dagh. While Persia on the east and Asia Minor on the west are not sharply barred off from Armenia, and have much the same natural features, climate, rocks, it is otherwise on the north and south. The zones of mountains separating it on the north from the Black Sea and the Georgian depression, and on the south from the Mesopotamian lowlands, have the same sharp, rugged, serrated character, with close, deeply wooded valleys, and act as buttresses to the series of elevated plains that constitute Armenia. Within these zones the country is very distinct and very grand, with its long, gently sloping stretches, its rivers threading their silent way low down in volcanic soil, its soft, convex shapes of hills and hummocks studding the floor of the tableland, its immense vistas with usually some giant snow-clad mountain like Ararat, Alajöz, Sipan, or Bingöl towering over all. From its great elevation (4000 to 7000 feet on tablelands, and up to nearly 17,000 feet in Ararat) above surrounding countries, it serves as a roof, and sends down its waters (famous world-rivers as Araxes, Euphrates, Tigris) to the Black and Caspian Seas and Persian Gulf. In the plateau regions lying to the north of the spinal mountains (Ararat system) recent volcanic action has been very great (about Akhaltsykh, Ardahan, Akhalkalaki, Alexandropol, Kars), but south or west of these, in Tauric or Turkish Armenia its effects, if not so frequent, are no less grand and impressive.

From Mr. Lynch's pages the main features common to the whole land, and the salient differentiating points of each district stand out clear; and although one may never be privileged to see them in reality, yet, thanks to his skill and sedulous care, those splendid heights and their surroundings—Ararat with its glorious dome and pyramid and its mighty chasm, Nimrud with its massive walls and deep lake, Sipan with its cairn-strewn basin above the sweet sea of Van, Bingol with its "thousand tarns" and limitless panorama—and all the chief ridges and passes of this ancient country, need no longer be dim or unfamiliar to Western minds.

II. Historical and Archæological.—A country of so central and com-

manding a position could not escape being drawn into the great world-movements. We may not lightly dismiss its claim to high antiquity, as indicated by the Armenian assertion of their descent from Haik, the great-grandson of Japhet, or the Biblical and traditional references to it as the earliest seat of the human race. Semiramis, Sardanapalus, Alexander the Great, the Romans, the Assyrians, the Persians, the Byzantine Greeks, the Kurds, the Turks, in turn overran it.

Two peoples alone (if indeed they be not proved to be but one), the Khaldians or Urardhians and the Armenians, appear as regular inhabitants and rulers of native dynasties. They have only quite recently been located in history. This has been done by the discovery and deciphering of inscriptions on stones found over an extensive region as far west as Palu on the Euphrates (Murad Su) and as far west as Kehsin and Lake Urinayeh. Commenced by Schulz and St. Martin at Van as early as 1828, this work has been extended over the whole country, and carried on through the century by Brosset, Hincks, Guyard, and others, and is now almost completed by Bleck and Leymann and Sayce, with the result that a whole vanished Oriental civilisation has been brought to light—a new language and new people (apparently neither Semitic nor Indo-Aryan), and a splendid monarchy rivalling Assyria. Dhuspas was their chief seat, and Biaina their province, but in course of time these names were transposed, the city becoming known as Van (Biaina), and the province as Dosp, while to the Assyrians the kingdom was known as Urardhu (Ararat).

These Vannic records bear no date, but from the names of Assyrian rulers contained in them and names of contemporary rulers of Urardhu in the Assyrian inscriptions, the chronology is settled at *c.* 1000 B.C. to *c.* 600 B.C. After the Khaldians (as we know from Herodotus and from the trilingual tablet set up by Xerxes for his father Darius on the face of the citadel rock at Van) the Assyrians were the rulers of Armenia, and then (probably about 500 B.C.) we begin to hear of the Armenians, while the Khaldians, under the name of Alarodians, appear only as subordinate in importance. Whether the Armenians came in as a fresh infusion (as akin to the Georgians, from SW. Europe) and mingled with the Khaldians, or whether they were an old native stock come into prominence, is not settled, but it is certain they absorbed the Vannic civilisation, and readily assimilated the Assyrian.

A large and interesting portion of Mr. Lynch's book is that in which he describes the deserted city of Ani and the Armenian kingdom of the Middle Ages. During the decay of the Caliphate and before the supremacy of the Ottoman Turks, a line of powerful kings, the Bagratid dynasty, ruled Armenia for about two centuries (ninth to eleventh A.D.), and Ani, situated on the Arpa Chai, within sight of Alagöz and Ararat, was their capital. They acted as capable intermediaries between the Greco-Roman West and the Moslem East. The vast remains of the city, the cathedral, the chapels, castle, and walls, show a very high style of architecture, and tell of a vanished civilisation of no mean order. Indeed, everything points to the Armenian race having been susceptible of the highest culture. That they are not higher up now among great races is due to the fact that their development was suddenly arrested by the Seljukian conquest, and has never been allowed to proceed under the long Turkish subjection. Their traditions, their aspirations, and their Church, are all that is left to Armenian nationality. The moral prestige, if not the actual power, of the Armenian Church is still great, and is at once the standing memorial of a once free and independent race, and at the same time the pillar round which the remnants of nationality cling.

Edgmiatsin, with its monastery of St. Gregory (the Illuminator, apostle of

Christianity to Armenia) at the foot of Ararat, is the true centre of Armenian life. There is the seat of the Primate or Katholicos of the whole Armenian cult, who is elected by the churches, whether in Russia, Turkey, or elsewhere. Mr. Lynch was present, opportunely, at the installation of the famous septuagenarian Mekertich Khrimean to that post, and met him several times. It is clear that while perfect religious tolerance is exhibited by Turkey, Russia has acted very unfairly, as if jealous, in seeking to play into the hands of its own Greek State Church, and curtail the privileges of the Armenian.

III. Social and Political.—Mr. Lynch rates the Armenians higher in intellectual and administrative ability, at least potentially, than their rulers. It has been said as a taunt that an Armenian is more apt at using his head than his arms or legs, but the fact that they are more industrious, more engaged in commerce, in the mechanical arts, and in agriculture, than their neighbours, only shows that they can use their head to some advantage. In Russia they are unmolested by their natural enemies the Kurds, but oppressed by a censorious, dictatorial government—a system that attempts to assimilate all (in church, schools, social customs) to one cast-iron standard. In Turkey they are in constant danger from the raiding Kurds, but on the whole have more freedom and scope, for at least "the mind is left free." In Russia they dare not rebel, in Turkey they may and do.

He derides the so-called Pro-Armenian Europeans who lay all blame of the recent disorders and massacres on Turkish officials and Mohammedan fanaticism and shows that there was no such thing as a rising against the Armenian religion as such. He points out that while the revolutionary movement, nipped so severely in 1890, began inside Armenia, the disturbances of 1894-95 were all in the peripheral regions outside the limits of Armenia proper—*e.g.* Sasun, Sivas, Trebizond, Diarbekr—and were fomented by able agitators (not devoid of church support) like Damadean and Boyajean.

No one can deny that there are good Armenian grounds for an Anti-Turkish movement. The Armenians are denied the right to carry arms and to serve in the army—in common thus with all the Christian subjects of the Porte—while the lower mischievous tribes of Kurds and Kizilbashis are armed and active all around them. They feel their miserable lot as helots, while conscious of their own native superiority and dignity. These children of an old civilisation, dwelling on their great tablelands amid their ancient churches and towns grouped around the centre of their national life at Edgmiatsin, have heard the voice of the West, have recognised that it spoke a language already familiar to them in their own instincts and in the whole tone and teaching of their Church, and have responded in their own way.

The Armenian question resolves itself not into one of religion so much as into one of proper distinctive government for the various districts inhabited by a mixed population of Christians and Mussulmans, and exposed to the ravages of tribal migratory Kurds. Will Europe remain, as heretofore, practically inert, unable to do the right and necessary thing because of international jealousies, while she repudiates her own spirit working in and waking up Armenia, and stultifies her own solemn enactments? Britain at least must take surer means to justify her name and position than she has yet done in this cause. Otherwise Russia will be forced to advance westward on the pretext of order, and then the great avenue of our growing trade to Persia and the East *viâ* Erzerum will be barred, and the last chance of using the Armenians as intermediaries in the higher things of life between the enlightened and progressive nations of the West and the sunken or sluggish nations of the East—which by their whole history and character they are so well fitted to be—will be lost for ever.

Report on the Census of Porto Rico, 1899. Lt.-Col. J. P. Sanger, Director. Washington : Government Printing Office, 1900.

The above report, fully illustrated, which has now been issued, reflects great credit on the Director and his staff of assistants. The census of Porto Rico, taken on November 10, 1899, shows a population of 953,243. This shows the rate of increase to be 16 per cent. Since 1887 the population has increased by 154,678. The females number 8721 more than the males, an excess amounting to ·9 per cent. of the total population. In 1887 the excess of females in the *de jure* population was only 478, and in the *de facto* population the males were 523 in excess. In 1860 the males outnumbered the females by 9653, or 1·7 per cent. of the total population.

On the Results of a Deep-Sea Sounding Expedition in the North Atlantic during the Summer of 1899. By R. E. Peake, M.Inst.C.E. With Notes on the Temperature, Observations, and Depths, and a Description of the Deep-Sea Deposits in this Area. By Sir John Murray, K.C.B., LL.D., D.Sc., F.R.S. London (Royal Geographical Society Supplementary Papers), 1901. Pp. 1-44. With two Maps.

This paper forms an interesting and extremely valuable contribution to oceanography, and it shows how the routine work on a purely cable-surveying expedition may be utilised in the interests of science. The primary object of the expedition was to ascertain the contours of the bottom over the routes of the proposed cables (which have since been laid) between Europe and North America *via* the Azores, and from May 15th to August 1st the sounding-tube was sent down about five hundred times, only three of the soundings being in depths less than 100 fathoms. But while carrying through this heavy piece of work, Mr. Peake was able to make many current observations in the neighbourhood of the Gulf Stream, and, in addition to recording the temperature of the surface water at frequent intervals, he took over one hundred and fifty observations of the temperature at the bottom, about one hundred of which were taken in depths exceeding 1000 fathoms.

In working up and discussing his materials, Mr. Peake was fortunate in securing the co-operation of Sir John Murray, whose description of the deposit-samples brought home occupies the larger portion of the paper, and is illustrated by a large-scale map of the North Atlantic basin showing in colour the distribution of the marine deposits. There is also a bathymetrical chart of the Azores Bank, based principally on Mr. Peake's soundings, which brings out the wonderful diversity in the relief of the sea-floor in this region, apparently due to volcanic action.

The detailed current observations given in the paper seem to show that the Gulf Stream does not consist of a body of warm water moving steadily across the North Atlantic in the direction of the Irish coast, but that the movement is more probably somewhat in the form of bands of current which curve and re-curve on one another, forming swirls of large area whose strength and direction change almost daily.

One of the most important results of the expedition is that derived from a study of the deep-sea temperature observations, which seem to indicate that there may be a seasonal variation in the temperature of the water even in the greatest depths of the ocean. It has hitherto been usually taken for granted that variations of temperature are limited to the superficial layers of oceanic waters, and that in deep water the temperature remains practically constant from season to season and from year to year.

In running two lines of soundings, almost parallel to each other, between the British Islands and the Azores, the second about ten days later than the first, Mr. Peake observed a higher temperature throughout the second line, and the same is the case for the two lines between the Azores and the North American coast, the second about six weeks later than the first. In depths exceeding 2000 fathoms the difference is not great, but it is still sufficiently marked to merit attention, the bottom temperatures recorded on the earlier trip from the Azores to New York ranging from 36·2° to 36·4° F., while those on the later trip from Nova Scotia to the Azores range from 36·5° to 37° F., and the bottom temperatures recorded on the earlier trip from the Azores to the Irish coast ranging from 36·2° to 36·8° F., while those on the later trip from the Azores to the English Channel range from 37° to 37·4° F. The difference at contiguous stations deeper than 2000 fathoms amounts in some cases to 0·8° F., and in lesser depths it may exceed 1° F. A series of temperature observations taken by the same thermometers in the hands of the same observer should be strictly comparable, and therefore it seems necessary to conclude that the temperature of the water was really slightly higher when the second series of readings was taken.

The value of the scientific results obtained by Mr. Peake during this expedition should induce the Telegraph Cable Companies to include similar observations whenever possible, in the programme of work on board their ships when engaged in surveying routes, or in laying and repairing cables.

The Life of Major-General Sir Robert Murdoch Smith, K.C.M.G., Royal Engineers. By his son-in-law, William Kirk Dickson. With Portrait, Maps, and other Illustrations. Edinburgh and London: William Blackwood and Sons. MCMI.

Mr. William K. Dickson has, in this beautiful volume, done justice to the charming personality and imperial services of our late distinguished Member of Council, General Sir Murdoch Smith, R.E. Alike as a savant and an expert in art, as a classical archæologist and a diplomat whose services to Great Britain in Asia cannot be too highly praised, Murdoch Smith deserves this memorial. His Scottish origin and training, and the years at the close of his busy life which he gave to his native country, and especially to Edinburgh, make this record of his career particularly interesting to us. But, indeed, his character was greater than his career. To all, European and Asiatic alike, he manifested an innate courtesy which carried captive even those who knew him least. His attitude towards the natives of Persia, and his sympathetic treatment of all his Asiatic subordinates, make this Life a book which should be studied by every British official and traveller who goes to the East. The story is well told of the expedition which secured for the British Museum the magnificent sculptures of Halicarnassus and Cnidus, and not less so the narrative of the Cyrene adventures which he organised at his own expense, with almost equally rich fruits for the great collection of the nation. All that was a fine preparation for the fifteen closing years of his life, which he spent in developing our Edinburgh Museum of Science and Art. But all that was nothing to the services which he rendered to science, to commerce, and to art, as the virtual creator and guardian of the Indo-European Telegraph, and as a representative of British honour and influence in Persia for long years of exposure and toil. It is this later part of the Life which has a keen interest for us, especially at a time when all Murdoch Smith's fears as to the action of Russia have been justified. He was ever gentle and cautious, in writing as well as in action, but ever thoughtful and far-seeing. Hence the value attached to his views during his life, and their importance at the present time. These words of Lord Curzon, the

"stubborn and selfish antagonism of Russia," exactly express the opinion of Murdoch Smith, whose letters to Colonel Champain, his chief, especially that of 28th January 1875, reveal a foresight and warning which were unfortunately unheeded at that time.

This book is, moreover, a valuable contribution to our geographical knowledge. Of every country he explored or in which he resided, he writes with the true geographer's instinct. He died in our midst as he had lived all his life, the truly Christian officer and gentleman. We commend this record of what he was and what he did for the Empire to all his countrymen, especially those who rule or reside among Asiatics. His loss is still mourned. He was laid to rest in the Dean Cemetery of Edinburgh, only seventeen months ago, at the age of sixty-five.

Stanford's Compendium of Geography and Travel. (New Issue.) *Central and South America*: Vol. I. By A. H. Keane, F.R.G.S. Edited by Sir Clements Markham, K.C.B. London: Edward Stanford, 1901. 13 Maps and 84 Illustrations. Pp. xxii + 597 and Index. *Price* 15*s*.

"In the new issue of this series, the single volume originally devoted to Central America, the West Indies, and South America is replaced by two, each somewhat larger than their predecessor. The very ample additional space thus secured has been found no more than sufficient to embody the more important results of the numerous scientific expeditions made to almost every part of Latin America during the last two decades. . . . Many of the discoveries were of a fundamental character, profoundly modifying the views hitherto prevailing on such questions as the tectonic constitution of both Central and South America, the West Indian orographic systems, the distribution of plants and animals over the whole area, the cradle and primitive migrations . . . the ethnical relations" of the human inhabitants.

"Attention has also been claimed by the recent political changes, . . . by frontier questions, . . . by inter-oceanic ship-canal projects, by transcontinental railway schemes, and by the altered economic conditions. All these transformations called for adequate treatment, if only to show that in the New World material and moral progress is no longer confined to 'Anglo-Saxon America,' and that henceforth the Hispano-Lusitanian commonwealths enter into the comity of the other cultured nations on a footing of absolute equality and independence."

The satisfactory carrying out of this programme by the two well-known geographers named on the title-page gives to the present volume a distinctive place in its series. The various features of excellence commended in preceding volumes are equally present in this one. It is, however, possible to feel that the long period over which the issue of this "new issue" of the Compendium is spread will somewhat seriously detract from its usefulness as a homogeneous work.

Through Persia on a Side-Saddle. By Ella C. Sykes. London: John Macqueen, 1901.

Those of our readers who have perused the first edition of Miss Sykes's fascinating work, *Through Persia on a Side-Saddle*, will not be surprised to hear that a second edition has been required. The new edition is some fifty pages of letterpress shorter than the first one—unfortunately, so we think, for every word of the first edition was interesting and graphic. The greater part of the illustrations also have been omitted from the new edition. On the other hand, there is added an interesting preface by Sir Frederic Goldsmid, C.B., K.C.S.I., in which he briefly

describes what he saw of Persia while engaged in boundary delimitation work there some forty years ago. The remarkable progress made during these forty years cannot escape the notice of observant readers.

Some Literary Landmarks for Pilgrims on Wheels. By F. W. Bockett. London : J. M. Dent and Co. Philadelphia : J. B. Lippincott Co., 1901. *Price* 3*s.* 6*d.*

This little volume contains some essays descriptive of scenery and roads in Surrey, intermixed with notes and reminiscences of distinguished men of letters who have lived there. It purports to be written for cyclists, and the reiterated glorification of cycling is somewhat tedious and irritating. The first three essays have already appeared in *Macmillan.*

The French Stonehenge. By T. Cato Worsfold. London and Derby : Bemrose and Sons, Limited. *Price* 5*s.*

This graphic and erudite brochure on the French Stonehenge, *i.e.* the megalithic remains near the Bay of Quiberon, on the coast of Brittany, is of interest rather to the antiquarian and archæologist than to the geographer. It is a reprint, with numerous additions and illustrations, from the *Journal of the British Archæological Association*, in which Mr. Worsfold, after a detailed description of these wonderful stones, and a comparison between them and the corresponding English remains at Avebury, comes to the conclusion that they were "first, monumental places of burial among a pre-Celtic race, being used later, from time to time, for assemblies of a religious or possibly political nature ; secondly, that they were used and adopted by the Romans in many instances for shelter and residence ; and that, thirdly, they were subsequently utilised by the peasantry for the latter purposes." The illustrations are excellent.

Comment j'ai parcouru L'Indo-Chine. Par Isabelle Massieu. Paris : Librairie Plon. Plon-Nourrit et Cie., 1901. *Prix* 5 *fr.*

In 1896 Mme. Isabelle Massieu set out on a tour through French Indo-China and British Burmah, and in the volume now before us she gives us a bright and lively account of what she saw, how she was treated, where she went, and what she thinks of the country and people. Apparently she was the first French lady to travel in some parts of these French colonies ; so her reception was as enthusiastic and brilliant as even a Frenchwoman could desire, and Mme. Massieu could and did enjoy herself thoroughly. She did not go off the beaten track, so there is nothing of original exploration in the work, but it is instructive and interesting as presenting from a clever and intelligent Frenchwoman's point of view what is already well known to us from the writings of Monnier, Barthélemy, and others. She naturally has no great love for the English, but she acknowledges most cordially the hearty and lavish hospitality and kindness she received in Burmah from all ranks of officials ; and although denouncing the frigid justice and want of sympathy between the British and the races they govern, she does not deny or minimise the success of our administration, and she calls attention to the ridiculous number of officials required for French Indo-China, as compared with the English officers who rule British Burmah. From the preface we learn that Mme. Massieu continued her tour to China, Japan, Mongolia, Siberia, Turkestan, and the Caucasus : so we may join in the hope expressed by Monsieur Brunetière, that some day she will publish a continuation of this interesting work.

THE ROYAL SCOTTISH GEOGRAPHICAL SOCIETY'S

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FOR HIS DISTINGUISHED SERVICES AS AN EXPLORER AND ADMINISTRATOR IN AFRICA

THE SCOTTISH

GEOGRAPHICAL

MAGAZINE.

THE PROTECTORATES OF GREAT BRITAIN IN TROPICAL AFRICA.

By Sir Harry H. Johnston, G.C.M.G., K.C.B.

During the first half of the nineteenth century Great Britain might have assumed a Protectorate over nearly all Africa between the tropics of Capricorn and Cancer, without exciting much comment or any effective protest on the part of any European Power, provided, of course, that we respected strips or patches of coast-board actually belonging to Portugal or France. But although the United Kingdom at that period was far ahead of any other European nation in its energetic attempts to reveal the mysteries of Inner Africa, to trace the course of the Niger, the Congo, the Zambezi, the Gambia, the Senegal, and the Limpopo; although our agents, first of all Europeans, had crossed the Sahara desert from the Mediterranean to Lake Chad and the Niger, had penetrated to Darfur and the regions of South-Central Africa, now called Bechuanaland and Rhodesia, our forefathers shrank, perhaps wisely, from the enormous responsibility and expenditure involved in such an undertaking as the protection and development of Negro Africa. Strenuous efforts were made to put down the sea-borne slave-trade; the Lower Niger, the Lower Congo, the Zanzibar coast-line were policed by our bluejackets; our trade had begun to lay hold of the East and West African coasts, exceeding many times in volume that carried on under any other flag. Our friendly relations with Tunis and Tripoli, coupled with the efforts we had made to open up a way across the Sahara to the fertile Sudan, greatly increased British commerce with North Africa. In all probability, therefore, those who then ruled the destinies of the United Kingdom were wise in declining to annex or protect large portions of the interior of the Dark Continent when there was no let or hindrance to our com-

merce and no attempt on the part of other European Powers to establish themselves in these regions.

But the events which followed on Stanley's epoch-making journey along the course of the Congo from east to west compelled Great Britain to take steps to secure her control over a reasonable share of tropical Africa: for this journey of Stanley's led to the founding of the Congo Free State and the Berlin Congress, and to a rush on the part of France, Germany, Portugal, Italy, and Spain to carve out large slices of the Dark Continent as colonies, protectorates, or spheres of influence. Even the independent Dutch element in South Africa, whose separate nationality had been to a great extent created in 1881, aspired to extend its rule over the regions between the Limpopo and the Zambezi. If during the last quarter of the nineteenth century we had stood apart with folded arms, refusing to do as others did, we should have been left at the present day with a few tiny patches on the West Coast of Africa, and with Cape Colony and Natal, while our trade with tropical Africa, which now stands at a value of something like £10,000,000 per annum, would have dwindled to a perfectly inconsiderable sum; for, unfortunately, coincident with the march of the European Powers on Africa rose stronger and stronger a preference on their part for a protective tariff, or for measures which should selfishly encourage and protect the trade of the dominant European nation to the prejudice of commerce carried on under foreign, if friendly, flags. Between 1885 and 1900 two motives compelled the advisers of the British sovereign to place under the protection of the British flag about one-sixth of tropical Africa. One was a desire to carry out philanthropic tasks such as the suppression of the slave-trade and the unhampered exercise of Christian propaganda; and the other was the necessity of keeping open for Great Britain and her Colonies and Dependencies (such as India) a reasonable proportion of the Dark Continent as an unrestricted field for British commerce. Only we ourselves, and perhaps our American cousins, know how real and disinterested were the philanthropic movements which lasted throughout the nineteenth century, and which obliged Great Britain to take upon herself the tremendous expense of suppressing the slave-trade, and of attempting to Christianise a large proportion of Africa. *We* know that these efforts were wholly dissociated from interested motives, ridiculous as this assertion may appear to a Frenchman or a German; not that the French or Germans are by any means incapable of similar philanthropic work, but somehow or other since Napoleon's famous phrase about "a nation of shopkeepers" they refuse to believe that the British can really desire to put an end to the slave-trade (for instance) without making such a mission a cloak for securing valuable territorial possessions. When the history of Africa comes to be impartially written, however, it will be seen that fifty years of slave-trade suppression on the part of Great Britain led to no more than the acquisition of isolated ports or depôts at Sierra Leone and at Lagos. Whether or not it was wise from a practical point of view, it should be perfectly clear to the same impartial historian that our assumption of a Protectorate over Nyasaland, which has extended to the wider limits of British Central Africa,

and over Uganda, were undertaken primarily for purely philanthropic motives, and without the prospect or the hope of ulterior gain. Much the same might be said about the reconquest of the Egyptian Sudan. Political motives connected with our necessary possession of Aden obliged us to acquire the opposite coast of Somaliland, and very valid commercial considerations compelled us to place Nigeria, Southern Rhodesia, British East Africa, Zanzibar, and the hinterlands of Sierra Leone and the Gold Coast under the British flag.

In one way and another (excluding the African colonies we possessed before 1880) we have added to our empire about 1,500,000 square miles of tropical Africa. On the west coast we have secured both banks of the river Gambia almost as far inland as that river is navigable for steamers. We have added a hinterland to the settlements we had on the Sierra Leone coast, which is nearly the size of Scotland. At the back of our ancient settlements on the Gold Coast we have acquired the Ashanti country and other kingdoms beyond it, stretching northwards to the tenth degree of north latitude. Yoruba has been added to Lagos, and the three governments of Lagos, Southern Nigeria, and Northern Nigeria, whose boundaries fuse one with the other, rule over a magnificent territory between the Niger delta and Lake Chad which in area is nearly twice the size of the United Kingdom of Great Britain and Ireland. North of the old limits of Cape Colony and Natal, and of the formerly independent Dutch states, we have added to the British Empire Bechuanaland, Rhodesia, and British Central Africa—a mass of territory nearly equal in extent to the united areas of France and Spain. In East Africa we have undertaken the Protectorate of the two islands of Zanzibar and Pemba, of Uganda, and of East Africa, which together offer an extent of about 300,000 square miles, and all Northern Somaliland, which has an area not far off that of Ireland. We have in addition assumed the responsibility for the maintenance of law and order in the Egyptian Sudan—another four or five hundred thousand square miles of tropical Africa.

And now the cold fit has succeeded to the hot flush of excitement. These African additions to the empire have involved us in heavy expenditure for administration and development and for defence against internal or external enemies; for the rivalry of European Powers still continues. Prince Bismarck, not without malicious forethought, laid down the principle at the Congress of Berlin that these African Protectorates must be effective, that it was not sufficient to paint the country on the map of Africa with the national colours of the state that aspired to protect it; these Protectorates must be followed up to a great extent by effective occupation. It is true that the convenient term, "sphere of influence," was adopted later on, which was supposed not to entail quite such heavy responsibility: but what have we seen whenever we contented ourselves with obtaining a recognition of our sphere of influence! Uganda was brought within our sphere of influence in 1890, but the journey of Dr. Peters and the agitation of the French missionaries entailed on us effective occupation if we wished to maintain that country under British control. Our several-times-delineated sphere of influence in Nigeria

was continually transgressed by French expeditions until the whole of it was dominated by British forces. We were ourselves tempted to disregard Belgian and Portuguese claims which were merely paper claims, and compelled both the Congo Free State and Portugal to show effective occupation before we respected their rights.

On the other hand, to those who argue that it would have been sufficient to have bargained with foreign Powers for a fair field to be kept open for British commerce, and that after such arrangements we might have seen without misgivings huge territories in tropical Africa pass under the French or German flags, I would say: How far have the implicit assurances regarding free-trade in all the Congo regions under the sway of France been respected? Is it not the case at the present time that, despite the greater part of French Congo having been included within the free-trade area, the only two British firms still able to trade there are not allowed to purchase an ounce of rubber? How much trade under the British flag now exists with German East Africa? I call attention to these facts with no desire to say disagreeable things about France, Germany, or any other European Power. To my thinking—and I have travelled in Africa since 1879—the only way to secure a fair field for British commerce was to place a reasonable proportion of Africa under the British flag, and to cease wrangling about our rights to trade in those other portions of Africa which came under the sway of other European Powers. We should not propose to go to war with France to insist on her respecting the provisions of the Berlin Act, however much we may regret the treatment accorded to Messrs. Hatton and Cookson in French Congo. It is to be hoped that Messrs. Hatton and Cookson will turn their attention now to territories like Uganda, British Central Africa, and Southern Nigeria, where rubber quite as good as that produced by French Congo may be found growing.

Public opinion in the United Kingdom is still kept in a healthy state of activity by the want of unanimity which prevails amongst our advisers in the press and on the platform. Besides those who are still ardently in favour of acquiring or developing territory in Africa, there are those who would try to prove in the first place that all such acquisitions are absolutely unprofitable, and that in regarding these Protectorates as laudable enterprises in philanthropy, we are wilfully deceiving ourselves; a great deal of exaggerated nonsense is talked about the introduction of gin and clothing and bloodshed into happy Arcadias where naked, teetotal negroes led placid lives in happy ignorance of the wicked world without. I will take this last contention first, and attempt to show you that if we have been pursuing philanthropic aims purely and simply, then we have had our money's worth in the results already achieved in these African Protectorates.

Whether or not formulated in so many words, we set out a quarter of a century ago to suppress the land slave-trade, put down internecine war and cannibalism among the natives, secure a fair field, if no favour, for Christian propaganda, and introduce some degree of civilisation to the negro. In the prosecution of these objects we had to war against Arabs, Fulahs, Somalis, and negroes who were opposed to our inter-

ference; and in the course of these wars or in the rough administration which followed them, there occurred, no doubt, isolated and regrettable acts on the part of Europeans which were immoral, or cruel, or thoughtless, but which were little grains of sand compared to the huge boulders of abominable wrongdoing which negro has flung against negro.

Our critics point to the wars which have occurred between the British forces and the natives as a proof that our protection was not desired and had to be imposed by force. They single out an individual atrocity as a sample of the white man's daily conduct; and having thus shown the supposed fallacy, from the philanthropical point of view, of our expensive efforts to administer an area in tropical Africa, which equals the united extent of Europe without Russia, they allege that there has been no justification in results achieved for the bloodshed which seems to have been inevitable in the founding of these Protectorates.

Those who read the works of the English, German, and French explorers who travelled at the back of our West African colonies on the Niger, in the Western Sudan, and about Lake Chad down to, let us say, six years ago, must admit that unless one and all of these travellers had been deliberately lying, the bloodshed and misery that went on in these regions was incomparably more awful than the whole sum of "atrocities" inflicted by ill-conducted Europeans, or produced by European warfare with the natives incidental to the extension of European rule over the western third of Africa. I for one, with every desire to be unprejudiced, cannot come to any other conclusion than that the natives of Nigeria have immensely gained in happiness and security of life and property wherever we have undertaken the direct administration and control of the countries in which they live.

Those who may desire to realise what the condition of the natives was before British control of some kind was established in Nigeria should especially read the works of Barth, Rohlfs, and Baikie, and perhaps may not find beneath consideration the epitome of a negro's life in the Western Sudan which I penned in a little book called *The History of a Slave*, not a single incident in which was not based on facts either known to and seen by myself or credibly reported by European travellers. Two hundred, three hundred negroes may have been killed in a war which abolished the bloody rule of Benin, but this caused the death, often under circumstances of horrible torture, of at least a thousand negroes *per annum*, while under this dominion no one but the king or the sorcerer dared to grow rich, or had any security that the property accumulated by his industry would remain with him and descend to his children. Visit the rivers of the Niger Delta now, and see if you can state with truth that the negroes are not happy, numerous, and commencing to lead a civilised and comfortable life. Then again, in British Central Africa. Prior to the effective development of British control continual loss of life was going on amongst the natives. The Arabs and their adherents, the Muhammadan Yaos, traded and raided all through the eastern part of the territory for slaves, this slave-raiding resulting in a very great loss of life, whilst the miseries

endured by the slaves on their way to the coast have scarcely if at all been exaggerated by travellers like Livingstone. Mlozi, the Arab raider, who lost his life in the final struggle at the north end of Lake Nyasa, must have been responsible in his time for the death of something like 10,000 negroes of the surrounding Wankonde tribes. The Arab often killed for the mere lust and joy of killing. His black slaves and soldiers shared his ferocity. Captive women were needlessly murdered in cold blood. Their children were torn from them and thrown into the camp fires or spitted on spears. A large number of boys were mutilated to provide eunuchs for Muhammadan harems. Bands of Zulus who had left South Africa owing to the civil wars in the early part of the nineteenth century established kingdoms which involved perpetual bloodshed in civil wars, in witchcraft persecutions, and in aggressive attacks on other tribes in the territories west of Lake Nyasa. Half-castes of Goanese extraction set themselves up as independent chiefs on the central Zambezi, and slew, with the same ferocity as the Arab, those whom they could not enslave. There was scarcely a wilderness which one crossed in the early days of the British Central Africa Protectorate which did not bear traces, old or recent, of destroyed villages and abandoned plantations. To possess a few cattle, or to have cultivated a little more corn than was absolutely necessary for the food of one's family was sufficient to draw down on one the attacks of robbers or the pressure of one's own chief. A warlike tribe like the Awemba would devastate the countries round their home in a ring fifty miles broad and of immense circumference. If you visit the Kazembe's capital near Lake Mweru at the present day you will still see a large proportion of the population without hands or without ears, or mutilated in some other fashion, these being the punishments or acts of spite to which the native ruler was chiefly inclined. I should think until the British Protectorate became effective ten per cent. of the negro population of these countries was killed every year by the poison ordeal. In most districts there was not a woman who had reached fifty years of age but had had perhaps ten times in her life to flee into the bush and conceal herself there, half starved, whilst her native village was in the hands of slave-raiders, invading Zulus, or the soldiery of her own chief, who were amusing themselves and their master by a little rapine and shedding of blood. In the wars which were necessary with Arab, Yao, and Zulu to found the Protectorate—wars, it must be remembered, carried on in the main by natives of the Protectorate fighting under our flag—there cannot have been killed from first to last more than 1500 people on both sides. The subsequent growth of the population is sufficient witness to the gain in human life and happiness which has been purchased by the death of those 1500 men.

It has been the same in Uganda. If one reads the works of Speke, of Stanley, of the Rev. W. P. Ashe, of Lugard and Colvile, one realises what a bloody country was the kingdom of Uganda before it came under British control. The flow of human blood must have been such a common sight as to render its inhabitants singularly callous. Speke gives a pathetic account of Mwanga's wives being hurried off to a cruel

execution, for most trivial reasons, raising their wailing cries of "O my Lord, O my Master" as they passed him on the way. Sometimes the reasons for these death-sentences were that a wife had failed to close the door as she passed out of a courtyard, or she had pulled the door to when to do so was a breach of native etiquette. The worship of the spirits in Uganda and Busoga involved constant human sacrifice. At the accession of a new chief in Busoga disgusting mutilations took place of young men and virgins which must have resulted in their death after dreadful tortures. In the countries speaking the speech of Unyoro, native custom positively required the suicide of wives on their husbands' graves. But the warfare that took place—the constant loss of life occasioned by civil wars, slave raids, or the aggressions on or by other states; raids from Uganda into Unyoro to obtain extra wives for the chiefs, raids from Unyoro into Toro and Ankole to snatch cattle and seize women. Then again farther east: whole tribes wiped out of existence. This has occurred again and again. The population of parts of Kavirondo on the slopes of Mount Elgon, of the Nyando valley, and of much of the Nandi plateau has been absolutely extinguished, most of the men, women, and children being slain, and the remnant starving to death in the bush. One can only say that in every district there prevailed absolute insecurity for life or property. There may have been the most carefully framed native laws and customs inflicting on the native's daily life an amount of etiquette which we should find intolerable; but although these may have secured the law and order of a village, they were no defence against aggression from a rival village, or the downward swoop of some robber tribe who scarcely even felt the common tie of humanity with the peaceful cultivators whose blood they shed with positive enjoyment, whose habitations they laid waste, and whose cattle they stole. Famines, epidemics of smallpox or of bubonic plague, attacks of a virulent dysentery caused by bad water and semi-starvation, would slay here six thousand, here ten thousand, elsewhere wipe out a whole nation. The cattle plague would come down from the north, and since there was no central government to check it, or to segregate it, disease among the cattle would wipe off all the herds of a country as large as Wales, reducing its inhabitants, who had hitherto depended solely on the produce of their flocks and herds, to starvation or a disastrous emigration.

As regards famines, I may be told that British rule in India has of late been coincident with terrible famines. That is true; but the people who put this forward do not stop to inquire how bad the famine would have been if there were no British Government, or whether the famine could ever have taken place but for the enormous and unchecked increase of population which has taken place under British rule, whereby India possesses almost more inhabitants than she can support. As regards Uganda and Busoga and the countries to the north of Mount Elgon, where famine has occurred since our acquaintance with these countries, it has been of a kind which will henceforth be certainly preventable under a well-organised administration. Warfare and the deflection of cultivators to unprofitable fighting was one reason. Partial

failure of rain was another; but this last would have been of but little effect if the natives had been taught to irrigate their fields from streams which never fail.

Freedom of religion has certainly been one result of a British administration established in these Protectorates. A man may now be Catholic or Protestant, Muhammadan or Pagan without fear of his life or without loss of his property. I am honestly convinced, and so I think would be any unprejudiced observer, that so far as happiness of the natives goes, our Protectorate over Uganda has been justified as it has been elsewhere in Africa.

It is not within my province to pronounce on the work of other nations on the same lines. I should certainly say that the condition of Tunis, Senegal, and Dahome under the French was a hundred times better than the state of those countries when entirely left to the devices of native rulers. Here and there a native of Unyamwezi may feel the heavy hand of a German sergeant, but the people know at any rate that as long as they pay their taxes and obey the law their lives and property are secure. But I feel we have quite enough to do to look after our own possessions and spheres of influence in Africa without turning aside to criticise the work of other nations. Until we are sure that not a fault, not an error in judgment remains in our own rule, that there is not a thing left undone that ought to be done, we may save ourselves the waste of time and energy involved in trying to show how badly the French, Germans, Belgians, Italians, and Portuguese manage their possessions. Let their work be judged eventually by its results. If the results are good, then the work cannot have been wholly bad. If all these nations are treating the natives abominably, or—as is sometimes complained of the French in Senegal—with mistaken kindness, then no doubt the expensive failure of their efforts will be sufficient punishment to the countries at fault. We have at any rate secured a sufficient share of Africa in which to put our own philanthropic theories in practice, and in which to give our commerce absolutely free play.

In theory, I maintain that inasmuch as we entered upon the assumption of Protectorates over East and Central Africa, mainly in the interests of the natives, to put down the slave-trade, and in the case of some countries to establish British protection at the natives' request, in preference to allowing them to come within the sphere of another Power; as the immediate outcome of these Protectorates is of benefit principally to their negro inhabitants, it is to the *natives* that we should look in the first instance to provide, according to their means, the funds necessary to maintain an economical but effective administration. If every adult male native in these Protectorates paid eight shillings a year in taxation, there would be little if any need to resort to the treasury of the United Kingdom for funds to supplement the cost of administration. There would also be no cause for the British taxpayer to complain if coffee or rubber or gold or ivory or all these subtances combined failed to provide a lucrative commerce for the British market. The Protectorates would then be administered purely in the interests of the black man. He at least in the climate of the country wherein he was born

does not suffer to the same extent from the diseases which afflict the European who attempts to settle in parts of tropical Africa; he at least is happy and content if he can maintain flocks and herds of cattle, sheep, and goats, and grow foodstuffs suited to his country and his palate. But the native in many cases has no cash with which to pay his taxes. He can only earn the money by working (say) for a month, or by collecting and selling rubber, coffee, or some other saleable substance which he can acquire without robbing other people; or he may breed cattle for the provision market, or collect oil, which is sufficiently valuable to meet the cost of transport to the European markets. But do these countries of tropical Africa produce substances of sufficient value to induce the European and Asiatic trader to buy them from the natives, or to cultivate them on his own account by means of paid native labour? If they do—and the fact has long been established in West Africa—then again the question of an equilibrium in the Protectorate finances is ultimately decided. Supposing for a moment, however, that coffee is destined to be a partial failure in British Central Africa,[1] or that the existence of coffee, cacao, ivory, oil-seeds, hides, and live-stock in moderate quantities in Uganda are not sufficient to maintain a large and profitable commerce, is there no other way by which the natives of these East African Protectorates may prosper, make money, and, with far less sacrifice than the average inhabitant of European countries, support their own local administration? There is, I believe, a method which, properly regulated, might be productive of most beneficial results. In Africa, south of the Zambezi, there exists an enormous demand for negro labour, especially in countries where climatic and other conditions make it impossible to use white men. If between the Zambezi and the Nile there exist millions of black men by no means disinclined to work for a fair wage, and south of the Zambezi there are white men prepared to lay out millions of pounds sterling in industrial development, it is surely a pity that some adequate means should not be discovered of bringing together this capital and labour. I know there are sentimental people or others, who criticise from a sheer love of criticism, who are on the look-out to pounce on any policy of this kind as slavery in disguise. Reasonable and reflecting individuals will not levy such a charge any more than they would call "slavery" the emigration of coolies from India to tropical countries where they can gain a good wage; or the migration of Britons to British Columbia, Australia, or South Africa, by such a term. Because in the past black men have been made to work for nothing, and the conscience of Europe became in time rightly shocked at such unfair treatment, this is no reason why the black man should not now be given facilities for working in South Africa for a wage which will seem to him of Central Africa actual wealth, a wage which will enable him to purchase many things which will raise his life above that of actual savagery. Those who would argue in favour of keeping the Central African negroes locked up in Central Africa are the real slaveholders. Why should the native of Uganda, of British East Africa, of British Central Africa, of

[1] I think no such thing.

West Africa be prevented from going to South Africa to earn money in the same way that the native of India or Arabia does? Europeans under a European Government can look pretty well after their own interests and protect themselves from ill-usage. But measures have to be taken to secure fair treatment for the Asiatic. If similar measures are put in force in Africa, south of the Zambezi, to protect the Central African immigrants from ill-usage or unfair treatment, I cannot see that any honest objection can then be raised to the natives of these tropical African Protectorates seeking well-paid work in that direction. Experiments have already been made in regard to sending labourers from British Central Africa to Rhodesia, experiments which I have watched with keen interest. Some of the men thus employed actually came on to England to take part in an exhibition at Earl's Court, and I was able to converse with them there on their experiences south of the Zambezi. Colleagues of mine, on whose reports I am able to place implicit confidence, have also assured me that all these Central African negroes were well paid for their work in the Rhodesian mines, and were released punctually at the end of their term of engagement, returning to their homes eventually (for some made the journey to England, others sought work farther south in Cape Colony) with sums of money that enabled them to start as small capitalists on their own account in their Nyasaland homes. But as the result of my inquiries, I ascertained that the present conditions of service in South Africa are not wholly acceptable to these Central Africans. It remains to be seen whether the South African authorities can see their way to removing these few objections. One point raised is the inequality of the stress in their labour. These negroes would not mind regular daily work between (say) 7 A.M. and 5 P.M.; what they object to is that for some days they are perfectly idle, and at other times they have to work desperately hard night and day under contractors who have piecework to accomplish and wish to do it under the time fixed in the contract. Another objection is the method of lodging these Central African labourers. They are housed in huge barracks, which are practically prisons; that is to say, the negro labourer is unable to leave them except during the hours of work. Although these barracks are clean, sanitary, and not uncomfortable, they are still to all intents and purposes prisons, and celibate prisons. The sleeping accommodation consists of large numbers of bunks in a single dwelling. These sleeping-places are constantly being washed out with strong-smelling disinfectants. No fires are allowed, a sore deprivation to the negro, who loves his hearth better almost than does any other race. The food is substantial and nourishing, but rather unappetising, and is cooked and served out wholesale. The reasons for this method of lodging and feeding the Central African negroes is, firstly, the danger of smallpox, and secondly, the fear lest they might desert before their term of service is complete. As regards the smallpox, it would surely be preferable to vaccinate the labourers on arrival, and then they would run no risk of getting smallpox. As regards the fear of desertion, no such fear need be entertained if the men are well treated and properly fed. Moreover, if they desert before their term of service is complete,

they lose their accumulated wages. What the Central African labourer would prefer is to be allowed to build a little hut of his own, of grass or any other material that is available, a hut wherein he could live by himself and cook his food in his own way. If this facility were granted, I am sure that work in South Africa would become extremely popular amongst Central African negroes. None that I have ever questioned or have had examined have ever complained of ill-treatment at the hands of the white man, and they are all surprised and gratified by the relatively high rate of wage. On the other hand, the wages paid to these unskilled Central African labourers are far less than what is now required by the better educated, more civilised Zulus, Bechuanas, and natives of Portuguese East Africa.

I would sum up this section of my address, which deals with the justification of our assumption of these Protectorates from the philanthropic point of view, by emphasising this principle: Between the Zambezi and the southern frontier of Egypt, between Mombasa and the Gambia, the countries under our rule, which are mostly inhabited by negroes, must, in the first place, be governed simply, economically, and effectively, in the interest of these negroes, on the understanding that the negro on his part contributes taxation according to his means—say, an average ten shillings a head per adult per annum—which will relieve the British taxpayer from the cost of supporting these Protectorates. The Protectorate will be maintained mainly in the interests of the negro quite independently of whether the country proves profitable or healthy to the white man. In that case the native must contribute to its support in the same degree as is expected of the citizens of any civilised state. It would be most unfair if the already heavily burdened taxpayer of the United Kingdom were to continue to put his hand in his pocket in order that negroes in far away African countries should be preserved from foreign invasion, from civil war, or from the slave-trade. The negro of course in these countries must be guaranteed the possession of the soil he occupies. He must be a free man, free to take his labour where he will, free even not to work provided he has fulfilled his very simple obligations towards the State. But if he is to expect to be governed by us without any sacrifice or contribution on his part, then I maintain it is unfair that he should be given for nothing the rights and privileges of citizens of civilised communities.

But is there to be no profit then to the white man, no return for the capital he has invested in this African undertaking? As a matter of fact, I maintain that in principle the Imperial Government should take note of the money it has expended in the creation and development of these Protectorates, and attach the sum-total of this expenditure to these native States as a debt, an advance of funds which in days of coming prosperity should be gradually repaid to the Mother-Country, or on which, at any rate, interest might be paid into the Imperial exchequer. (I wonder if it is sufficiently realised that it is the taxpayer of the United Kingdom who, with rare exceptions, finds the money for all these experiments in empire, and for the defence of these additions to the British hegemony? With the exception of a contribution made by

Australia towards the administration of New Guinea, and possibly small contributions made by Cape Colony towards the administration of Basutoland, I believe I am correct in saying that it is the 40,000,000 inhabitants of England, Scotland, and Ireland alone that pay for these additions to the empire, and it is to the exchequer of these islands that any repayments should be made of these grants-in-aid.) I think as regards West Africa it is hardly necessary to expatiate on the profit our commerce derives from the British possessions on the Gambia, at Sierra Leone, on the Gold Coast, and in Nigeria. Manchester, Glasgow, Liverpool, Bristol, London, and Belfast would lose a notable section of their commerce, some of their most thriving industries would come to grief if there were not these extensive dominions in West and West-Central Africa under the British flag. I do not need to expatiate here on the valuable trade products which come from this part of the continent; you have only to turn to the numerous books of reference dealing with British trade to ascertain statistics about gold, palm oil, palm kernels, india-rubber, coffee, ivory, oils of many kinds, wax, and skins which come from West Africa to British ports, and the enormous quantities of cotton, woollen, and cloth manufactures, hardware, provisions, and trinkets which are exported from English and Scottish ports to the West Coast of Africa in British ships, which form a not inconsiderable section of that huge mercantile carrying-trade of the British Islands. There is no doubt about the profits we derive from our West African possessions. Those who look deeply into these matters may, however, tell me of the apparently barren expenditure which is forced on us far in the interior of Northern Nigeria, and ask whether this is profitable, and what British firms are established on Lake Chad or in Sakatu? To these I would reply that it is really indirectly the British ports on the Niger Delta and on the West Coast of Africa towards which many of the productions of these interior countries find their way by native traders. So far as my personal predilections go, I would in all these possessions be inclined to take one thing with the other, to make a rich port on the coast contribute towards the expenditure of maintaining peace in a valuable hinterland. I should be disposed to suggest to his Majesty's Government that our African Protectorates north of the Zambezi and south of the Sahara might all be brought under one department and one simple direction from London: that all our possessions in West Africa between Lake Chad and the Gambia should have but one budget; that the same thing should take place in East Africa, where the Protectorates of Zanzibar, East Africa, Somaliland, and Uganda likewise should frame inclusive estimates for expenditure and revenue and be brought under one general plan of administration. A similar unification might be effected for British Central Africa, even though Nyasaland, North-Eastern Rhodesia, and Barotseland were brought under the South African Commission. We have a High Commissioner for British South Africa whose general direction of affairs might well be extended to Tanganyika. If there were another High Commissioner for all British East Africa, and likewise another for British West Africa, greater unity of direction would be given to matters of local policy, and a certain

economy in administrative expenditure might be effected. Profits made in the revenues of Zanzibar or Somaliland might assist in defraying the deficits in the local budgets of Uganda and East Africa. Surplus revenue in the Gold Coast or on the Gambia might go towards that expenditure which will be necessary to keep the peace in Northern Nigeria and open it up to profitable trade.

I have shown that there is no question about the general value of the commerce of our West African possessions. British Central Africa and North-Eastern Rhodesia are well on their way towards providing a local revenue which meets the administrative expenditure. The annual trade in British Central Africa with Great Britain has risen in ten years from a value of something like thirty-five thousand pounds to a quarter of a million. The little Sultanate of Zanzibar pays its own way and asks for no subsidy from Great Britain. The trade in Northern Somaliland is being rapidly developed by natives of India and Arabia, and the local revenue in that Protectorate will not be long before it meets the cost of an economical administration. The doubts which are most freely expressed by critics at the present day with regard to the commercial value of these Protectorates relate more especially to East Africa and Uganda. In these countries the British Government has spent something like five millions of the taxpayers' money in building a railway nearly 600 miles long from Mombasa to the north-eastern shore of the Victoria Nyanza. East Africa is much of it (in its present condition) a disappointing country. A portion of the coast-line between Lamu on the north and the German frontier on the south has a belt about twenty miles broad of cultivated ground, and provides a commerce chiefly for British Indian merchants, of considerable value, and perhaps contributes towards the revenue of the East African Protectorate some £40,000 annually in taxes and duties. But a great deal of the interior of the East Africa Protectorate is harsh, barren steppe, very sparsely populated. Near the boundaries of the Uganda Protectorate along the Kikuyu Plateau and on the slopes of Mount Kenia there is magnificent land, covered with rich and valuable forest, and rather thickly inhabited by a somewhat turbulent race. But much of this country appears to be chiefly valuable to the natives, who are not as well disposed towards us as they should be, and not at all inclined to contribute by the payment of a small Hut Tax to the upkeep of that Administration which for several years past has completely protected them from the Arab slave-traders and the Masai cattle-raiders. I believe myself that East Africa is sufficiently rich in mineral and vegetable productions of value to make it eventually quite self-supporting by its trade. Still, this country has protected East Africa almost admittedly, not because it is valuable in itself, but because it is the coast region of the countries round the Great Lakes, especially the well-known kingdom of Uganda, and it is to the commercial development of the Uganda Protectorate that we must look for the eventual profits to be made by the Uganda Railway, and possibly for the providing of any deficit which may occur in the budget of East Africa.

With regard to Uganda, I would point out that the local revenue

rose from an annual £23,000 in 1899, to £66,000 in 1901, while at the same time the cost of administration was brought down from an average £230,000 a year to about £180,000. Thus the amount of grant-in-aid asked from the British taxpayers has considerably diminished during the last two years.

Perhaps a few notes on the principal products of Uganda, which might be turned to profit in our commerce, may be of interest to some among my present audience.

As regards minerals, a large collection of rocks was brought home by my expedition, and submitted to analysis at the British Museum. The result was to show the probability of gold being found in certain districts, and to establish the existence of graphite mines in two places. The country abounds in hæmatite iron, and in ordinary iron ore, and there is, perhaps, a little copper. Some of the rock specimens collected by Mr. F. W. Isaac in the Baringo District indicate the possibility of precious stones existing in these formations. Salt of very good quality is obtained from the salt lakes, which have become the property of the British Government in the District of Toro, in Western Unyoro, and also on Kavirondo Bay. Whether this salt would be worth exportation is a matter of doubt, but it circulates throughout a good deal of Central Africa as a valuable article of barter. It therefore has an intrinsic value as a source of revenue to the State. Broadly speaking, however, at the present time no absolute discovery of unquestioned mineral wealth has been made in the Uganda Protectorate; though it must always be remembered that Africa is the continent of surprises, and Uganda may yet be found to contain payable gold which, with the aid of the railway and steamer transport, can be worked at a profitable rate. Since, however, we can only deal with known assets, we must at present look to the development of a really prosperous commerce by means of animal and vegetable productions.

As regards animal productions, there is ivory of the very best quality. So long as the British Government can determinedly enforce the Game Regulations by a small annual expenditure, and protect female and immature male elephants from being killed by natives or Europeans, there will not be much danger of the African elephant becoming extinct in a territory so large as this, where Nature has reserved vast marshes and leagues of forest for the shelter of this beast. Provided the most rigorous care—such care is effectual in India—was taken of the females and young, there is no reason why a certain number of male elephants should not be killed yearly by designated agents of the Government, and their ivory be sold to merchants as part of the Protectorate revenues. I see no reason whatever now why attempts should not be made to tame the African elephant and use it as a transport animal. For this purpose it might eventually prove advisable to import trained Indian females which could assist in teaching the young captured Africans. The experiments I have tried myself in the way of rearing baby elephants who had not yet been weaned from their mothers proved unsuccessful, as apparently it is impossible to rear any African elephant on cow's milk. Perhaps, however, my four failures in this respect need not be held to

discourage other experiments. In any case, the late Mr. Richard Baile showed that it was possible for natives to capture young elephants able to subsist on leaves and grass, yet not so old as to be utterly unmanageable or untamable. It may be along this line that the next experiments are made, and imported female Indian elephants might be of use in taming the newly-captured elephants. In time, when African elephants had been trained to Keddah work, the whole system of capturing, taming, and training elephants might be conducted on Indian lines. If after many years of trial the African elephant is pronounced to be hopeless as a domestic animal (and it should be remembered that most African elephants in captivity, of the male sex at any rate, have shown themselves to be hopelessly savage), then at least for its magnificent ivory the creature is worth preserving as an asset to the State. If the Indian elephant shows himself to be more docile than the African elephant, it must be remembered, on the other hand, that he is of very little value for his ivory.

Zebras of two kinds (the magnificent *grévyi*, and the equally handsome but smaller Böhm's Zebra) exist in the Uganda Protectorate in countless swarms. The foals are easily captured by the natives, and can be reared by means of asses as foster-mothers, the ass being one of the commonest and cheapest of domestic animals, at any rate over the eastern parts of the Uganda Protectorate. These fine large asses, in fact (which are simply the Nubian ass slightly domesticated), might of themselves be an article of export to East Africa and India.

Giraffes, and most of the larger African antelopes, might be strictly preserved, but when they increased unduly in numbers specimens of them might be captured for sale and transmission to zoological gardens. Where any of these animals are really found in excess, and have to be thinned, it must be remembered that their hides are almost always of value commercially.

Either there is no true Tsetse Fly anywhere in the Uganda Protectorate, or it is not able to obtain and introduce into the bodies of domestic animals the malarial germs which cause tsetse fever. Therefore theoretically there is no part of the Uganda Protectorate in which cattle, sheep, goats, and horses cannot be kept. But although the Protectorate is fairly well supplied with fine cattle, and possesses enormous herds of sheep and goats, it must be remembered that at different periods during the past twenty years portions of the Protectorate have been visited, to a disastrous extent, by a cattle disease, some kind of pleuro-pneumonia, coming from the Dinka countries in the Egyptian Sudan, and gradually spreading right down to South Africa and across the continent to Sierra Leone. Some countries in the Uganda Protectorate, however, have never been ravaged by this disease. It should also be possible, perhaps, to attack the malady at its source in the Dinka countries, and eventually put a stop to these ravages which have inflicted such appalling losses on East and South Africa. At any rate at the present time Uganda has enough cattle to be able to export beasts by means of the Uganda Railway for consumption in the markets of East Africa. If cattle-breeding prospers and remains untouched by any further disease of a serious

nature, the export of hides from Uganda ought to amount to a very considerable item in its commerce.

The ostrich of the North African species, with fine white plumes in the male, is a native of the northern and eastern districts of the Uganda Protectorate. Its eggs and recently hatched young are constantly brought in by the natives for sale. There is no reason why, in the Rift Valley, and over the greater part of Uganda, ostrich farms should not be established. It is possible that the feathers of the North African ostrich might average slightly more in the market than those of the South African species.

Honey bees exist over the greater part of the Protectorate, and in many districts are partially domesticated by the natives, to whom honey is an important article of diet. The wax of these bees would certainly form in time an article for export.

Turning to vegetable productions, we have in the first place coffee. Whether originally introduced or not from Abyssinia, coffee is at any rate native now in a semi-wild form to the better forested regions of the Uganda Protectorate, its berries producing a coffee of excellent flavour. Not only might the wild coffee be gathered and sold by the natives, but it would seem as though this country was singularly well adapted for coffee plantations as the forested regions have a regular and ample rainfall, the soil is very rich, and abundance of shade trees exist. Coffee could be grown on the lake shore all round the northern half of the Victoria Nyanza. Steamers could carry the coffee to the railway terminus on Kavirondo Bay, and it is probable that by steamer and rail and steamer again from Mombasa coffee could be landed at the European markets charged with a freight of not more than £2, 10s. a ton. On the other hand, I am not certain whether Uganda would produce the local labour for the coffee plantations as cheap as that which would be obtained in British Central Africa. Perhaps on the whole the advantages of the two Protectorates for coffee-planting are about equal.

Regarding the soil of Uganda proper and the adjoining districts of Busoga and Toro, Mr. Alexander Whyte says: "Generally speaking this soil is a reddish loam on a sub-soil of rich red or chocolate clay, sometimes of a great depth. At times patches of poor, gravelly soil crop up, more especially on the hill-tops. These are formed of disintegrated ironstone or igneous rock, and do not retain the moisture. The country is wonderfully free from surface stones and boulders. . . . The soil of the swamps and marshes is a black humus, formed by the decay of rank vegetation. One would naturally expect to find a deep deposit of this mixed with soil washed down from the surrounding hills: on the contrary, I have been surprised to find this black deposit often very shallow and almost invariably overlying a subsoil of kaolin clay. The question generally put is, What will *not* grow and flourish in Uganda? The furze and the broom grow so well that we are making hedges of them. Tomatoes grow quite wild. One plant was left by the boys when weeding my compound; it flourished so amazingly that I determined to keep the tally-fruits picked from it. The yield in two

months has been three thousand! It still goes on bearing clusters of lovely fruits, and covers a space of twenty feet square."

I have taken a photograph of a sunflower in the Botanical Gardens at Entebbe, which grew up in a few weeks and produced more than two hundred blossoms, all of them producing seed full of excellent oil.

Oats thrive well on lofty regions like the Nandi Plateau. Up to the present time wheat in Uganda has not been a great success. Inasmuch, however, as it has proved a success in German East Africa to the south of the lake, our comparative failure probably means that we did not select the right kind of wheat for the very varying altitudes of the Uganda Protectorate. As to Indian corn, sorghum, millet, eleusine, and other grains native to Africa or India, they flourish exceedingly, and are at any rate excellent and sustaining food for the natives.

The Sesamum and ground nut grow in many districts, and could be converted locally into an oil of considerable commercial value. The fibre of the Raphia palm, of three or four species of *Hibiscus*, and of the Sansevieria might be worth exporting. The Baganda make excellent ropes out of locally produced fibre. Tobacco grows almost everywhere in Uganda, but whether it could possibly compete with the tobaccos of the West Indies, India, and Borneo is doubtful. But it forms a very notable object of sale and barter amongst the natives, being eagerly purchased from those who have it by those in whose districts it is not cultivated. Indeed, in making journeys to distant parts of the Protectorate, one is obliged to take tobacco as one would cloth and beads. The sugar-cane grows luxuriantly in all the tropical parts of the Protectorate, and already steps have been taken to obtain from it a sugar which should at any rate suffice for the inhabitants of Uganda. Mr. Whyte considers many portions of the Protectorate admirably adapted for the cultivation of tea and cacao, the last-named plant having, through the efforts of Sir W. Thiselton Dyer and Mr. Whyte, been successfully introduced into the Uganda Protectorate. Cotton grows wild in Uganda, but, like tobacco, might probably not be worth exportation.

Amongst the commercial assets of Uganda, timber must certainly not be overlooked. The forests of the Mau and Nandi Plateau and of the slopes of Mount Elgon contain hundreds of thousands of magnificent conifers —juniper and yew. The timber of this gigantic juniper is to all intents and purposes like cedar wood. The mere thinning of these woods, which is necessary for their improvement, and which might be carried on concurrently with the establishment of European settlements, would provide millions of cubic feet of timber, which would find a ready market on the East Coast of Africa. In the tropical forests along the shores and on the islands of the Victoria Nyanza all the best African timber trees exist—ebony, African teak, African mahogany, ironwood, and acacia. It has been considered that, without detriment to the forests along the Uganda railway, or in these lacustrine districts, wood fuel could be used instead of coal, resulting thereby in an enormous saving in the working expenses of steamers and locomotives.

We come now to what I believe to be the production of the surest value in the Uganda Protectorate—india rubber. Mr. Whyte is of

opinion that a tree of an allied species to the guttapercha of Eastern Asia grows in Buddu, and perhaps elsewhere in the forest-covered regions of the Protectorate. Unfortunately, the specimens collected to prove this statement have never reached their destination at Kew. But rubber of a very saleable quality is produced by two or more trees of the genus *Tabernæmontana*, and by perhaps three species of *Landolphia*. The rubber produced from these sources varies in value, according to the care with which it has been collected. The samples which we have had sold experimentally of Uganda rubbers have ranged in price from 1s. 1d. to 2s. 6d. a pound. The bulk of Uganda rubbers as at present turned out by the natives seem to realise about 2s. a pound when sold at Mombasa. Steps are being taken to properly instruct the natives in the best methods of procuring and preparing rubber for the market, and it is to be hoped that as the result not only no permanent harm will be done to the sources of rubber supply, but the purity of the Uganda rubbers may be well maintained, and secure for this article an average price of at least 2s. a pound.

In the preceding summary of the animal, vegetable, and mineral products known to exist in the Uganda Protectorate, I have said nothing about those which, though of local value, would not bear the cost of exportation to European markets. But it should be pointed out that although, in some instances, these products may not serve as exports, they are worth cultivation for local consumption. Take the sugar-cane, for instance. It might not pay to export Uganda sugar, but it will certainly pay—is paying—those people who have sufficient enterprise to turn the sugar-cane of Uganda into a crystallised sugar which is eagerly bought by Europeans, Indians, and natives, inasmuch as it can be sold to them at cheaper rates than sugar imported from abroad. The same thing would apply to cotton, salt, and tobacco.

Up to the present time British trade, that is to say, commerce conducted by natives of the United Kingdom, is by no means to the fore in the Uganda Protectorate. The firms of Smith, Mackenzie and Co. and Boustead Ridley were both, until recently, established in Uganda. Both have, to a great extent, withdrawn, owing to the difficulties of transport, and, in some cases, to a series of unlooked-for misfortunes. These and other British firms, in fact, have decided to hold their hands and restrain their enterprise until the completion of the railway and the placing of capacious steamers on the Victoria Nyanza. Whether they are wise or not in awaiting events I cannot say. Meantime two German firms are pushing ahead in all directions. One of these is the German East Africa Company. I understand that both the German firms are either subsidised by their own Government or by the German Colonial Society, and that this help enables them to create and carry on an extensive trade in Uganda, regardless of present profits or losses. The result has, I must admit, been most beneficial to the European officials who are not too well paid. Thanks to the enterprise of the German firms, stores were opened at Entebbe, Mengo, Fort Portal, and other places, even before the railway cheapened commerce and transport, and at these stores a great variety of European goods can be purchased. The Germans have been

selling excellent wine, whisky, groceries, and most of the necessities of European life, at prices which were certainly reasonable for the time and place. In fact, it really made existence possible for the official, who, before this German enterprise, either had to live on native food, or get into debt by purchasing provisions or wine in England and having them sent up country from Mombasa at a ruinous rate of transport and subject to innumerable risks. Almost simultaneously with the German came the British Indian. He rendered further benefits to the European community by bringing down the German prices, and by opening stores at places where even a German hesitated to penetrate. Within the term of my Special Commission Indian traders advanced their posts from Kampala (Mengo) to Toro and the vicinity of the Congo Free State, to five places in Unyoro, and all the posts at which Europeans or native soldiers were established in the Nile Province, besides opening bazaars at all the stations in the eastern half of the Protectorate. This commercial enterprise of the Germans and British Indians, of course, added largely to our local revenues, and did a great deal to encourage the natives to embark in trade in the products of their country. To the British Indians I can only wish unlimited success, since they trade under the British flag, and create trade, first in a small way, and then in a large way, where no trade hitherto existed. To the Germans, out of gratitude for their belief in Uganda, and for the comfort which they have added to the life of the European official by the opening of good shops, with provisions sold at reasonable prices, we should also wish success, since all trade in Uganda must conduce to the prosperity of the Protectorate and the increase of its revenues.

In addition to Germans and British Indians there came to trade in this Protectorate Persians, Somalis, one or two Greeks, several Armenians, and one Italian. A Persian has opened a soda-water factory at Entebbe. A native of Kach in British India is erecting hotels for British visitors at the principal stations on the Uganda railway and elsewhere in the Protectorate.

With regard to the Germans and to the Indians, they appeal to my liking as a Government official, because they make little or no pother; they ask for no guarantee and for no concession. They enter the country and pursue their trade under the laws in force, making the best of things as they find them. In the case of British firms, I am bound to admit that they are somewhat apt to ask for guarantees, for assured contracts, for concessions of land or monopolies of production before they are able to venture their capital and enterprise. I am quite of opinion that in some districts, in some directions, special steps should be taken to induce natives of the United Kingdom or of its self-governing Dependencies to engage in industrial enterprises. At the same time, so far as my own opinion goes, I am quite opposed to the handing over of large concessions or estates to companies or associations who have given no proof of their ability to develop these, who will probably only use them as counters with which to speculate on the share market, and who are likely to override roughly existing native rights and industries. I earnestly hope that our Government may share these views to a reasonable extent.

At any rate, until, say, ten or fifteen years we find that the natives of the Uganda Protectorate are hopeless, that they will do absolutely nothing to develop, under our direction and for their profit, the resources of the country in animal, vegetable, and mineral wealth—until then I consider we ought to be most careful not to repeat a policy which has been shown to be unfortunate in its results in the Congo Free State and in certain French colonies. Commerce ought to be absolutely free and unrestricted in the Uganda Protectorate. If the native profits by developing the resources of his country, the administration of the Protectorate will profit also, for the native will have money with which to pay his hut and gun taxes, the export duty on certain goods, or the import duty on others. The European merchant will find his gain in the cheapness of native labour, and consequently the low price of the native products which will be tendered to him for purchase. But do not let us—at any rate until we have tried other expedients and failed—hand over large districts as exclusive concessions to this or that company for rubber, timber, ivory, or coffee. Special arrangements in regard to mining may possibly have to be made owing to the utter inability of the native to develop that particular source of wealth. At the present time any European or foreigner (or, for the matter of that, any native) can purchase from the Crown an estate of 1000 acres in any one place, provided such estate be the property of the Crown and not of a native or natives, and unless it contains special deposits of minerals or areas of forest which for good reasons the Government may not wish to sell. Therefore there is no hindrance in the way of modest enterprise. As to *im*modest enterprise—a single association buying up a whole province, or obtaining an exclusive rubber concession over 25,000 square miles, I for one am totally opposed to any such policy, at any rate until it has been shown that a mass of small traders and four million natives cannot between them develop the resources of their country in a manner productive of profit and happiness to all.

MOUNTAINS.

By Professor James Geikie, F.R.S.

II.

In a former article in the *Magazine* (September 1901) we gave an outline of the geological history of Original or Tectonic mountains. Some of these, it was shown, date back to a most remote antiquity, while others are not nearly so old—not a few having come into existence in quite recent times. It was further pointed out that, in the case of the youngest Tectonic mountains, internal structure not infrequently coincides more or less closely with external form or configuration. This correspondence is most clearly seen in recent Accumulation mountains, such as our still active volcanoes—the shape assumed by those moun-

tains being obviously determined by the arrangement of their constituent materials. Nevertheless, even active volcanoes do not escape the modifying influence of the various epigene agents of change, but are attacked in the same way as mountains of every kind, old and young alike. In their case, however, the rate of decay is usually exceeded by the rate of growth. Hence the rugged furrows and gorges, gouged out by torrents on the flanks of a growing volcano, tend to be obliterated from time to time by the products of successive eruptions. But the great chains and ranges of Folded mountains cannot thus repair the ravages effected by epigene action. The growth of mountains of this type we have every reason to believe is a very gradual and protracted process. No sooner, therefore, does upswelling and wrinkling of the crust begin than the slowly ascending surface is attacked by all the atmospheric agents of change. And so powerful and effective is this action, that if the rate of crustal movement did not exceed the rate of denudation, no mountain-range could come into existence. It would be degraded as fast as it grew. Obviously, however, crustal deformation, no matter how gradual it may be, has in many, if not in all, cases exceeded the rate of denudation. Nevertheless, so potent are the agents of erosion that they have succeeded in very greatly modifying even the youngest elevations of the crust.

Although no portion of a growing mountain-chain can escape this modifying influence, it is evident that the process of degradation must be carried on most actively along lines of water-flow. As torrents, streams, and rivers cut their way down into the massif, larger and larger surfaces of rock become exposed to subaerial action. The shattered debris, detached from cliff and mountain-slope, slowly or more rapidly enters the drainage-system, gradually becomes reduced in size, and is eventually swept away in the form of gravel, sand, and mud, beyond the limits of the mountain area. So in time profound and broad valleys are ploughed out, and these continue to be deepened and widened, as the process of mountain-making goes on. Thus in the great transverse valleys which radiate from the backbone of a growing mountain-chain, the rate of erosion keeps pace with or even exceeds the rate of rock-folding and uplift. New or secondary mountains gradually come into existence along the flanks of the primary elevations—a mountain-chain, in a word, grows by the successive addition of contiguous parallel ranges. But the large transverse rivers flowing out from the primary axis are not deflected by the younger ranges which thus slowly rise across their path. The rate of valley erosion exceeds the rate of crustal deformation, and thus mountain-range after mountain-range is successively sawn across by the primeval rivers descending from the axis of the chain.

We may therefore conceive of the growth of a polygenetic mountain-chain being continued through a long period of time—the gradually bulging and wrinkling crust being concurrently worn and furrowed by epigene action. The mountain-mass as a whole, however, continues to increase in elevation notwithstanding the ravages of frost and glaciers, of rain and torrents, of streams and rivers. Only in the valleys does

epigene action balance or exceed the elevating process. When at last all earth-movement ceases, then the mountains are steadily reduced in height, while the valleys continue to be widened and deepened, until eventually the broad mountain-land may disappear and be replaced by a gently undulating plain—a *plain of erosion.*

Many such plains are known. That they occupy the site of vanished mountain-chains is clearly indicated by their internal or geological structure. Some of these old plains of erosion, like that of the Belgian coal-fields, reach no great height above the level of the sea, while others attain considerable elevations, forming lofty plateaus. A study of such plateaus shows us that a chain of Original or Tectonic mountains, after it has experienced much denudation—after it has been reduced to its base-level and replaced by a plain of erosion—may again be uplifted. The crust may once more bulge-up, and the *plain* be gradually carried to such a height that it then becomes a *plateau of erosion.* Or, instead of being thus elevated, the plain may become submerged for a longer or shorter period of time. During gradual and long-continued submergence sediment may gather over the surface of the drowned land to such an extent that the site of the former mountain-chain may eventually be buried under a thickness of many thousand feet of stratified materials—gravel, sand, mud, etc. Subsequently the movement of depression ceases, and may be replaced by movement in the opposite direction—a general bulging-up or elevation of the area may take place. Should such ensue, then the buried plain of erosion will again rise out of the sea, and may even attain a height of many thousand feet above that level. In that case we should speak of the newly formed plateau as a *plateau of accumulation.* A section across it would show that the upper portion of the elevated area consisted of a great thickness of approximately horizontal strata resting upon and concealing the old plain of erosion.

Although Tectonic mountains tend to be gradually ground down to their base-level—it is seldom that the cycle of erosion is quite completed. Long before the mountains have entirely vanished, renewed crustal deformation may take place, and the much denuded area be either re-elevated or submerged, according as the earth-movement is up or down. In the former case we get a plateau of erosion, the surface of which may be more or less irregular, ribbed and knotted with the straggling cores and stumps of the ancient mountains. In the latter case, the sorely denuded mountain-land, carried down below sea-level, becomes in time covered with sediments underneath which the lower-lying parts of the plain of erosion may eventually become very deeply buried. Should the cores and stumps of the old mountains remain above sea-level as islets, they will of course escape burial, only to be subject, however, to continuous erosion. But should they be submerged, then they also will in time become partially or entirely concealed under gradually accumulating sediments. At a later period, should the sunken area be re-elevated to a very considerable height, we shall have a plateau of accumulation, consisting of approximately horizontal strata resting upon the irregular surface of the old plain of erosion. The horizontal strata will

naturally attain their greatest thickness upon the lowest-lying portions of that plain, and will thin away as they approach the stumps of the degraded mountains—the summits of which may even peer above the surface of the plateau, as so many islets in a far-stretching sea.

Examples of all these several stages and conditions are met with again and again, but it is not necessary for our purpose to go into detail. For the present it is sufficient to realise the fact that plateaus are of two kinds—namely *plateaus of accumulation*, and *plateaus of erosion*. The former consist of horizontally disposed strata, often resting upon and partially or wholly concealing an ancient plain of erosion. The latter are built up of inclined and disturbed rocks. In the case of the former, therefore, the shape of the ground is determined by the horizontal arrangement of the strata: in the case of the latter there is no coincidence between external form and internal structure.

Now it need hardly be said that plateaus, like all other land-forms, are in time modified by erosion. Just as Tectonic mountains of every type pass through a cycle of denudation, which may or may not be interrupted by earth-movements, so a plateau becomes in like manner the prey of the epigene agents, and may eventually be reduced to its base-level. After a plateau has been deeply incised by streams and rivers—when it has become traversed by a whole network of valleys, it gradually loses the appearance of a table-land, and assumes that of a truly mountainous region. This transformation is wholly the result of denudation. The mountains and hills are not Original or Tectonic, but *Subsequent* or *Relict*. They have not been constructed or built as moun-

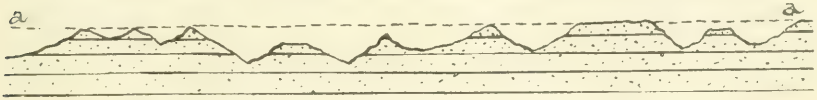

FIG. 1.—Relict Mountains carved out of a Plateau of Accumulation. *a*, *a*, Original surface of plateau.

tains, but are merely remaining portions or fragments of a formerly more extensive elevated area. They have been carved out of an old table-land and shaped into mountains by the gradual removal of masses by which they were at one time surrounded.

The form assumed by Relict mountains depends mainly upon the nature and arrangement of the materials out of which they have been carved. A plateau of accumulation, for example, tends to be cut up into a series of pyramidal or tabular mountains, and crested or flat-topped ridges, separating the various valleys from each other. And as the latter are deepened and widened, the massive segments of the old plateau become progressively narrower and gradually reduced in height. At a later stage most of these mountainous segments may have disappeared and only a few isolated cones and ridges or truncated pyramids may be left. Finally, every height may be levelled, and the old plateau be replaced by a plain of erosion.

In the north-west of Scotland we have excellent examples of Relict mountains carved out of an ancient plateau of accumulation. In that

region certain old crystalline rocks (Archæan gneiss, etc.) had at a very early geological period been reduced to a base-level. The plain of erosion thus formed was then slowly submerged, and became in time covered with a great thickness of red sandstones. Long afterwards the whole region was re-elevated, thus forming a plateau of accumulation, the upper portion of which consisted of thick red sandstones resting on the surface of a plain of erosion composed of Archæan gneiss. So prolonged a period has elapsed since that epoch of elevation that the red sandstones have been largely removed, and much of the old plain of erosion has been re-exposed. Very considerable masses of the overlying red sandstones, however, still remain, forming isolated cone-like or pyramidal Relict mountains, such as Canisp, Soulvein, Stackpolly, and Coulmore, or more closely associated aggregates of similar-shaped heights, such as the Torridon Mountains.

Having glanced at the general character of Relict mountains which have been carved out of a plateau of accumulation—that is, out of an extensive elevated mass of horizontal or approximately horizontal strata—we may now shortly consider the character of the mountains which are carved out of a plateau of erosion. The relatively level surface of such a plateau, as we have seen, is the result, not of sedimentation but of denudation. A plateau of erosion may consist of many different kinds of rock, arranged in almost any way. In not a few cases, as we have seen, such plateaus represent the sites of vanished chains of Tectonic

Fig. 2.—Diagrammatic Section of Plateau of Accumulation superposed on Plain of Erosion. *E, E*, Plain of erosion, replacing a chain of Folded Mountains; *T-R*, Torso-relict Mountains—the worn stumps of the former mountain-chain; *P, P*, Plateau of Accumulation—horizontal strata, out of which Relict Mountains (*R, R*) have been carved.

mountains. Externally they have a plain-like surface, internally they frequently show all the confused and complicated structures which are characteristic of true mountains of upheaval. Plateaus of this kind are well represented in Europe. The Highlands and Southern Uplands of Scotland, the Rhenish Schiefergebirge, the Scandinavian Mountains are all examples of highly denuded plateaus of erosion.

At a very early geological period lofty ranges of Tectonic mountains extended over what are now our Northern Highlands and Southern Uplands. During prolonged ages those ancient Caledonian ranges were subject to erosion, until eventually they were largely reduced to their base-level—only a few sorely wasted stumps and cores projecting above a gently undulating plain of erosion. Subsequently depression ensued, and the plain of erosion became, over considerable areas, more or less deeply buried under sedimentary deposits. To trace the geological history in detail is here impossible—it is too long a tale to tell—and we need do no more than realise the fact that eventually all the depressed areas were again re-elevated *en masse*.

The Highlands and Southern Uplands then appeared as plateaus.

Their configuration was upon the whole plain-like, the peripheral areas being to some extent occupied with approximately horizontal sedimentary strata, resting upon and concealing the old plain of erosion. In the central and more elevated portions of the plateaus that old plain formed the surface, and appears to have been here and there diversified by more or less abrupt heights, the worn and abraded torsos of the ancient Caledonian Mountains.

In the course of long ages the plateaus in question have experienced excessive denudation. To such a degree, indeed, have they been trenched and furrowed by multitudinous valleys, that they are now hardly recognisable as table-lands; their original plain-like character is well-nigh lost. They have been carved into rolling uplands, into regular ranges or

FIG. 3.—Relict Mountains carved out of Contorted Strata. [Section of a portion of the Southern Uplands of Scotland: after Messrs. Peach and Horne.]

irregular groups and masses of Relict mountains, the configuration and distribution of which have been determined very largely by the nature of the constituent rocks and the mode of their arrangement.

Sometimes, as throughout the larger portion of the Highlands and Southern Uplands, the Relict mountains have been sculptured out of the highly folded rocks forming the old plain of erosion; in other places, they are simply remaining portions of the younger rocks which overlie that plain; while, in not a few cases, the upper part of a mountain consists of the younger, and its basal portion of the older, rocks, the line separating the two series representing the old plain of erosion.

The forms assumed by Tectonic (folded) mountains, during the stage of early youth, are a more or less direct expression of their internal structure. The ranges coincide to some extent with upward folds (anticlines), and the intervening parallel hollows with downward folds (synclines). (See Fig. 4.) But with increasing age this approximate correspondence

FIG. 4. Symmetrical Flexures of the Jura Mountains. The ridges coincide with Anticlines, *a*, *a*; the parallel valleys coincide with Synclines, *s*, *s*.

between configuration and structure gradually disappears, until eventually every coincidence of the kind vanishes. Under the long-continued operation of the agents of erosion, the mountains are completely remodelled. (See Fig. 5.) When a mountain-chain has passed the age of maturity, the distribution and shapes of its component heights are determined directly by the character of the rocks and their geological structure. In this respect, therefore, highly denuded Tectonic mountains do not differ

from Relict mountains which have been carved out of an ancient plateau of erosion. In both cases it is the character or nature of the rocks and the mode of their arrangement which determine the position of the heights and their general configuration. Nevertheless, we must distinguish between the two kinds of mountains. A Tectonic mountain-chain remains *original* throughout all stages of its existence; it is a true Deformation mountain-chain until it is at last swept away, and replaced by a plain of erosion. A Relict mountain has not been built up, nor is it the direct result of crustal deformation. It owes its existence to erosion;—it is a mountain of circumdenudation. But the very causes

Fig. 5.—Appalachian Ridges of Pennsylvania. The ridges coincide with Synclines, *s*, *s*; the valleys coincide with Anticlines, *a*, *a*.

which have determined its existence must eventually work out its destruction.

We have referred to the forms assumed by mountains which have been carved out of plateaus of accumulation—pyramids, and truncated pyramids being the typical shapes of such mountains. Under favourable conditions, mountains of this kind often ascend in a series of abrupt terraces, or corbel steps. But much depends on the nature of the rocks. If the strata be more or less homogeneous in character, the step-like outlines are not likely to be pronounced. Instead of abrupt pyramidal heights we may have smooth rounded hills. The character of the climate has also a powerful influence—an arid climate fostering the formation of more or less abrupt pyramidal mountains; while under moist conditions the configuration of the heights tends to be smoother and less abrupt. Nevertheless, whether the horizontally bedded rocks be of one kind or another, or show alternations of many different kinds, and whether the climate be dry or humid, equable or the reverse—tropical, temperate, or arctic—the mountains and hills carved out by the action of the epigene agents are of the same type.

Relict mountains derived from the erosion of folded and contorted rocks have, as already shown, the general aspect of highly denuded Tectonic mountains. Hence sometimes we find them extending in the direction of the outcrops of the more durable rock-masses, and thus forming more or less regular ranges. In other places, again, owing to the presence of confused and complicated structures, the heights may exhibit little or no trace of alignment, although it is obvious that in this case as in the other, the position of the mountains has been determined by the nature of the rocks and their arrangement.

But all plains and plateaus do not consist either of horizontal or of highly contorted rocks. Between these two extremes of rock-structure there are many gradations. The degree of crustal deformation varies indefinitely. There are wide regions throughout which the rocks show only long, gentle undulations—the inclination of the strata from the horizontal not exceeding a few degrees. The Midlands of England, for

example, are composed of rocks which have a general dip at a low angle towards the east. Throughout the Central Lowlands of Scotland, from the base of the Grampians to the foot of the Southern Uplands, steep dips are exceptional. And the same may be said of many other parts of the world. Away from regions of mountain-uplift, indeed, there are vast continental tracts throughout which the strata show little disturbance—the beds rising and falling in more or less gentle undulations. Sometimes the undulations succeed each other somewhat rapidly—in other places, the crust has been bent up in one broad depressed arch, measuring many miles across. In highly denuded countries the tops of the anticlinal arches—the crests of the undulations—have invariably been removed, and the truncated ends of the beds exposed. In other words, the shape or form of the ground does not coincide with the undulations of the strata, but is the result of erosion.

The most characteristic type of hill or mountain carved out of rocks which have a gentle dip or inclination is the *Escarpment*. For the formation of this kind of feature certain conditions are necessary. The strata must not only be inclined, but some bed or beds must be harder or more durable than the others. We may have, for example, a series of relatively soft sandstones and shales, with one or more intercalated beds of limestone or other relatively hard rock. (See Fig. 6.) With an arrangement such as this it is obvious that the outcrops of the softer strata will succumb more readily to the attack of the epigene agents than those of the intercalated harder rocks. The latter, therefore, come in time to project above the level of the former. In the following diagram the upper dotted line (*a*, *a*) represents the original surface—a former

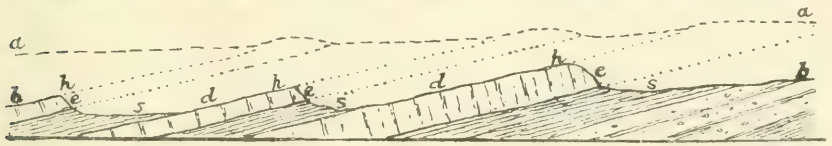

Fig. 6.—Relict Hills and Mountains carved out of gently-inclined Strata. *a*, *a*, Original Surface of Plateau of Erosion; *b*, *b*, Present Surface of the ground; *e*, *e*, Escarpments; *d*, *d*, Dip-Slopes; *h*, *h*, Relatively "hard" rocks; *s*, *s*, Relatively "soft" rocks.

plain of erosion. The lower continuous line (*b*, *b*) represents the existing surface, where *e*, *e* are escarpments, and *d*, *d* dip-slopes. This is the type of hill most commonly met with in Central England. A glance at any geological map of the country will show that all the prominent hills and high grounds are developed along the outcrops of the Jurassic limestones and the Chalk, and thus have a general northerly or north-easterly trend. Proceeding from the foot of the Malvern Hills towards the east, we first traverse low-lying plains of sandstone and argillaceous strata, until on the other side of the Severn we reach the Cotswolds, composed principally of limestones, which as they dip gently eastwards are succeeded by a series of argillaceous beds, forming again a region of undulating plains. Continuing our traverse in the direction of the dip, we eventually encounter another broad belt of high ground—the escarp-

ment of the Chalk. This escarpment is succeeded in its turn by a low-lying region composed mostly of soft clay strata and other more or less non-indurated materials.

When the strata, instead of being inclined in one direction for long distances, are arranged in a series of gentle folds, escarpments continue to present themselves wherever relatively hard beds crop out at the surface. In this way we not infrequently find lines of escarpment facing each other, as in the well-known case of the North and South

Fig. 7.—Section across the Wealden area—a denuded Anticline.

Downs which overlook the intervening Weald. Here we have an example of a highly eroded anticlinal fold, which is always a weak structure, and readily reduced by epigene action.

Synclinally arranged strata do not succumb so easily—the structure is relatively strong, and makes a stouter resistance. The rocks so arranged are not degraded so rapidly as the same rocks would be if disposed in the form of an anticline. In short, it is with gently undulating strata as with the steeper and more abrupt convolutions of Tectonic mountains—anticlines are frequently replaced by hollows, while synclines tend to be developed into heights. (See Fig. 5.)

In fine, one may say that however simple or complex the geological structure of a highly denuded region may be, the configuration of the ground, as worked out by epigene action, has been determined mainly by the character of the rocks and the manner of their arrangement. In a word, when we have deciphered the geological structure of a country, we have at the same time discovered the origin of its hills and mountains.

THE FIRST ENGLISH MAP OF INDIA.

By C. G. Cash, F.R.S.G.S.

The Hakluyt Society issued as their volumes for 1899 *The Embassy of Sir Thomas Roe to the Court of the Great Mogul*, edited by Mr. Foster, the Hon. Secretary of the Society. To these volumes I am indebted for some of the information and for the quotations in this article.

"The Company of Merchants of London trading into the East Indies" received its charter from Queen Elizabeth on the last day of the sixteenth century. In view of recent attempts at chronological controversy, it may be well to say that this was December 31st, 1600. By Papal Bull the whole of the Eastern half of the world had been reserved for Portuguese exploitation; but the English and Dutch, Protestant

nations, did not acknowledge this right of reservation, and entered into competition with the Portuguese for the riches of India. This competition led to much friction and not a little bloodshed; for the Portuguese tried to maintain their monopoly by force of arms, and the bold seamen of England and the Netherlands were as ready to fight as to trade. Several English seamen and merchants visited the Far East towards the close of the sixteenth century, and a Portuguese ship with a rich cargo was captured and brought to England. Hence arose the movement that led to the formation of the first of those Chartered Companies that have played so notable a part in the history of the expansion of our empire.

At that time the chief ruling power in India was that of the Great Mogul. The famous conquering and administrating Mogul, Akbar, died in 1605, and was succeeded by his son Jahangir. It was during Jahangir's reign that the English merchants of the Company first reached the port of Surat. Here they found themselves subject to the caprice of the local governor, and exposed to the attacks of the Portuguese, who also plotted to have them totally excluded from Indian ports. Open attack by the Portuguese they could and did successfully resist; but to deal with the subtle intricacies of Eastern diplomacy and intrigue demanded talents of a special order, and the Directors of the Company at home sought for a man of social standing and personal character such as would enable him to act as an ambassador.

They found their man in Sir Thomas Roe, gentleman, courtier, politician, adventurer—altogether a characteristic product of the Elizabethan period. He was admirably suited and entirely willing to go as the representative of King and Company, and left England early in 1615, bearing a letter and a present from King James to the Great Mogul. He reached Surat in September, and at once entered on his difficult task, that of gaining for the merchants of the Company a recognised standing as privileged traders in India. Jahangir had inherited from his father Akbar his outward graces without a corresponding measure of his inward greatness; and being attracted by the strong personality and fine demeanour of Roe, "showed personal esteem and liking for the ambassador, combined with a total indifference to the object of his mission." The fact was that to Jahangir the countries of England, Portugal, and the Netherlands were distant, unknown, and insignificant, and, though it was interesting and pleasant to receive presents from the merchants, it was quite out of the question to give them any definite or permanent standing in the country. After a stay of three years and a half in India, Roe was unable to secure more than that the merchants of the Company should be allowed to trade in peace and security; he could not obtain leave for them to become owners of lands or houses.

"He was the first of the long line of remarkable Englishmen who by their ability, their force of character, their unselfish adherence to lofty aim, have built up the British dominion in India: and looking down the ranks of his successors, it is not too much to say that few have equalled, none has surpassed him."

Roe's own account of his embassy contains many curious and striking incidents, one of which has a special interest for geographers. I tell it in his own words. "September 9th, 1617. The King comming by my house, I rode out to meete him. The custome is, that all men by whom hee passeth neare their gate make him some Present, which is taken as a good signe, and is called *Mombarreck*, good Newes or good Successe. I had nothing to giue, nor might fitly goe with nothing, nor stay at home without discourtesie; which made mee venture upon a faire Booke well bound, filleted and gilt. Mercator's last Edition of the Maps of the world, which I presented with an excuse that I had nothing worthy, but to a great King I offered the World, in which he had so great and rich a part. The King tooke it in great courtesie, often laying his hand on his breast, and answering: Euerything that came from mee was welcome. . . . Sep. 16th. At night, I rode to Court to visit the King, who questioned about the Booke of Maps. . . . Sep. 25th. Then he sent for the Map-booke, and told me he had shewed it his *Mulaies*, and no man could reade nor understand it; therefore if I would, I should haue it again. I answered: At his pleasure; and so it was returned." Roe's chaplain, the Rev. Edward Terry, was of opinion that the Mogul was displeased to find his possessions represented as covering so small a portion of the earth, while he styled himself "Conqueror of the World."

But far more interesting to the historian of geography is the fact that Roe's embassy led to the publication of the first English map of India. It appears that Roe intended to prepare a map of the country, and to that end made some collection of materials. But his personal acquaintance with the land was limited to the district lying between the Tapti river and Ajmere, and he seems to have had but little opportunity for geographical study. He returned to England in 1619 on board the ship *Anne*, the master's mate on which was William Baffin, the famous North-West Passage explorer. There is no record of their collaboration, but it resulted in the appearance in the year 1619 of a map, the description of which I copy from Mr. Foster:—"*INDOLSTANI Imperii Totius Asiae ditissimi descriptio: Ex indagatione Illust: Dom: Tho: Roe Equitis Aurati in Regia Mogollanica Legatum agentis Illustrata: Anno Sal:* 1619. *Vera, quae visa: quae non, reticta.* At the top of the map is a short title, *A Description of East India contayninge th' Empire of the Great Mogoll*; and in the upper right-hand corner appear the Mogul's standard and his seal, with the Persian names given in English characters. Along the lower margin we find the names of the engraver (*Renold Elstrack sculp:*) and of the vendor (*Are to be sold in Pauls Church yarde by Thomas Sterne, Globe-maker*), and, in a small label between them, the significant inscription: *William Baffin deliniavit et excudebat.*"

Of this map only one copy is at present known to exist, and that is in the British Museum. A much reduced facsimile appears in the second of Mr. Foster's volumes. Mr. Foster makes some interesting notes on the map, showing that some items in it are derived from Coryat's *Crudities*; that it was a great improvement on its predecessor in the Atlas of Mercator (and I may add in that of Ortelius also); and

that it remained substantially the standard map of India till the time of Rennell.

Some few years ago I became the possessor of a very interesting copy of the great Atlas of Ortelius, the copy presented by Ortelius to the famous Elizabethan historian and antiquary, Sir William Camden, bearing two inscriptions in Ortelius's writing to that effect. Besides the maps proper to it, this volume contained numerous sheets of maps, plans, portraits, and pedigrees, that had been pasted into it, and among these was a copy of Roe and Baffin's map of India. This proved to be a later issue of the map, with the date altered to 1632, and a new publisher's label: *Printed for Henery Tombes and Beniamin ffisher and are to be soulde at the Talbot without Aldersgate.* Otherwise the map is absolutely identical with the original edition. There seems to be no previous record of this later edition of the map, and no other copy is so far known to exist. A facsimile is issued herewith, and the original will be exhibited in the Society's Library.

THE BOUNDARY DISPUTE BETWEEN CHILE AND ARGENTINA.

By Hope Gibson.

Although the rupture that so lately threatened war between Chile and Argentina has been adjusted, there unfortunately remains ground for grave anxiety. The people of both countries are thoroughly aroused; the armies and navies have been put on a war footing; and internal political strife in either country might readily lead to some incident that would precipitate international conflict. This dangerous position of affairs has evolved from the obscure terms used in the Boundary Treaty of 1881; but it is only fair to add that it would indeed have been a marvellously clever treaty had it been prepared in such a way at that time as to have prevented the present trouble.

Following the treaty of 1881, commissions of experts from both countries worked together in harmony, erecting the iron pyramids that denote the boundary line on the summit of the Andes. But in 1898 these commissions found themselves hopelessly in conflict of opinion, and things came to a deadlock. This is not difficult to understand. As long as the Cordillera of the Andes consisted of a clearly defined range, the delimitation proceeded without the possibility of a doubt. But there are places, especially in the extreme south, where the Andes has been found to break up into several ranges of more or less the same altitude, among which lie valleys pointing in all directions. Instead of one watershed, there become many. Had even an imperfect survey existed in 1881, when the treaty was entered into, it would have been then realised that the definition, that the boundary line was "to be along the highest peaks of the range, *dividing the waters*," would prove inadequate. Take, for example, the case of a fertile valley lying in the very centre of

the Cordillera, and bounded east and west by ranges of practically the same height, from which streams meander down to a lake in the middle of the valley. On the shores of the lake there is the ruin of a small fort, constructed by the Argentines at the time they were crushing the Indians. But the valley has now become stocked by a few settlers, who claim to be, and are undoubtedly, of Chilian origin. Or again, another valley, where the western range is unmistakably the backbone of the Andes. A stream flows down its eastern slope, crosses the valley, doubles back to the west, and, plunging through a deep gorge in the very range where it had its source, falls into the Pacific Ocean. This valley, like the preceding one, is naturally claimed by both countries. But one of the most difficult problems to solve is where it has now been found that great *fjords* on the Pacific coast extend so far inland as to cross the locality of the boundary line, thereby entitling the Argentines to have ports on the Pacific Ocean—an eventuality, needless to say, never contemplated when the 1881 treaty was framed.

Things having come to a standstill in 1898, Chile and Argentina agreed to submit their differences to the British Government for arbitration, and the British Government appointed as tribunal Sir John Ardagh, Lord Macnaughten, and Sir Thomas Holdich. It would indeed be difficult to find three men in the world better adapted by talent and experience for the difficult task submitted to them. Before they had been able to get to work, however, a serious incident occurred, which gave rise to the gravest apprehensions. Some Chilians, in the direct employment of their Government, were discovered making roads and building bridges on one of the very pieces of ground that had been declared subject to arbitration, and therefore to be held as neutral territory *pro tem.* When called on for an explanation, the Chilian Government declined to say anything, because it had been reported that some Argentines had been seen travelling over neutral ground in the far south. Ultimately, however, Chile agreed to withdraw her men, who, she said, were merely making preparations to facilitate the work of the British Commissioners when they arrived. And Argentina promised, on her part, to make inquiries regarding the alleged violation of the territory in the south. The affair thus ends, but not before both countries had spent large sums of money in the purchase of war materials, even going to the extent of buying new men-of-war.

It is much to be regretted that Chile is proving so dilatory in submitting her case to the British tribunal. The Argentine one was completed and lodged some considerable time ago; and Dr. Moreno, who is in charge of the case in this country just now, has very kindly presented the Royal Scottish Geographical Society with two copies. These, with their wealth of detail both in text and in photographs, are now in the Society's library. Rumour has it that Chile has not been able to complete her case owing in part to confusion of opinion among her own experts. Be that as it may, it is amusing to learn that *The International Arbitration and Peace Association* (whatever that may be) has issued a manifesto, deploring "the prolonged delay that has been incurred by this dispute being referred to a commission of public men

already fully occupied with their own onerous duties," and suggesting that the "original questions" should, "even now," be placed before the standing tribunal established under the Hague Conference of 1899.

Turning to the actual value of the land in dispute, too little is known to form even an approximate idea of its intrinsic value. But it has again and again been said on both sides of the Andes that the mere extent of area, its monetary value, and all the other local conditions, do not compose the whole factor in the case. The real tension lies in the growing deep distrust and jealousy which each country has lately developed towards the other. In the Argentine there is a widespread belief that Chile means to break bounds as soon as she feels strong enough to do so, with the object of obtaining additional arable and pastoral land: that she looks with covetous eyes on the vast plains of her neighbour still remaining virgin soil: that whereas Argentina has now become a factor in the wheat supply of the world, it is but a few years ago since she bought flour for bread from Chile: that Chile now resents buying cattle from the Argentine; and that there is a spirit of aggression aroused in Chile which must be curbed at all cost. On the other side, that is, in Chile itself, the people have been taught to look upon their country as destined to be the dominant power in the continent. They call themselves, indeed, the "English of South America"; but they would be blind did they not see that it will only be a matter of a few decades till the growing production of the Argentines, if they remain in undisputed possession of their vast territories, will raise the country into a much more powerful position than that of Chile. It is therefore perfectly justifiable to conclude that the danger of war does not emanate from the eastern side of the Andes, where the Argentines have everything to lose and practically nothing to gain even if victorious. Should this war come it may assume much greater dimensions than has been publicly realised. Both countries have splendidly equipped armies and navies of equal strength; but it is very doubtful if they would be allowed to fight it out alone. Peru is simmering against Chile because that country will not make substantial progress in the settlement of the Tacna and Arica provinces question; Bolivia is in much the same way about her claim to a port in the Pacific. Should they seize the opportunity to attack Chile, Ecuador might invade Peru with which she has a little matter in dispute. Then Argentina would respond by calling on her allies, Paraguay and Uruguay, to take the field; and there would be every promise of a big blaze on the continent. How Brazil would act it would be difficult to say, but the state visits lately exchanged between her president and the president of the Argentine Republic were not without significance. Brazil would suffer very considerably were her food supplies, which she obtains from the Argentine, cut off by the operations of war. It is scarcely necessary to say that all this could not be looked upon with indifference in Europe. Leaving aside the injury to trade as affected by both the exports and the imports of these South American Republics, the amount of European capital now actually invested in them is very large. In Chile and Argentina alone there must be nearly £500,000,000,

principally, it may be mentioned, British capital. Therefore it would be greatly to the interests of the European Powers to interfere and to prevent a war which would be uncalled for and would cause so great a loss. But unfortunately the so-called Monroe Doctrine blocks the way, a doctrine that is less popular in South America than in any other place in the world. It is but natural that this should be so when it is remembered that there is a close blood relationship with Spain, Portugal, and Italy. And the Anglo-Saxons of the North protest so much about America for the Americans, that the Southern Republics cannot but be suspicious that their would-be protectors are not altogether so disinterested as they would profess to be.

Altogether the situation still remains unchanged, with many grave possibilities not confined to Chile and Argentina alone. It is to be devoutly hoped that wise counsels will prevail, and that an amicable arrangement will be arrived at.

In the meantime, the members of the Tribunal of Arbitration have informed the Secretary of State for Foreign Affairs that things would be accelerated were a Commission of Inquiry to visit the ground at once. His Majesty's Government has approved of this proposal, and has accordingly instructed Sir Thomas Holdich to proceed at once to South America, accompanied by an adequate staff of officers. It is very likely that there is a great deal more in this action than would at first appear, and that Chile and Argentina have their hands now practically tied, since it would be unfriendly, if not even insulting, to Great Britain should either attempt to provoke hostilities with one of the members of the tribunal actually on the spot.

PROCEEDINGS OF THE ROYAL SCOTTISH GEOGRAPHICAL SOCIETY.

Meeting of Council on 20th December 1901.

In addition to the election of new Members, as reported last month, the following business was transacted :—

It was resolved to confer the first Livingstone Medal on Sir Harry H. Johnston, G.C.M.G., K.C.B.

Certain changes in the Library Regulations were approved, and the Regulations now stand as follows, viz. :—

1. All books shall lie on the tables in the Society's Hall for one month after their receipt. They shall then be placed in the Library, and may be borrowed by Members. All books thus borrowed shall, before removal from the Library, be handed to the Librarian to be registered in a book kept for that purpose.

2. Only Members who have paid their subscriptions for the current year, and Life-Members, can borrow books from the Library. No person can borrow books in the name of a Member.

3. Members are allowed to have two books or three volumes out at one time, and not more without the special permission of the Library Committee.

4. No unbound volume, or part of any serial or periodical, shall be borrowed without the special consent of the Librarian.

5. Members shall return the books they borrow within six weeks, or ask for an extension of time. The Librarian shall have power to call in a book after it has been out a week. Should this rule not be complied with, a fine of sixpence weekly per volume will be imposed during unauthorised retention.

6. Should a Member lose any volume, or return it in a damaged state, he shall be liable for the cost of a new copy or of the necessary repairs, or shall replace the damaged volume by a new copy, as may be decided by the Library Committee.

7. A call for books shall be made once a year, viz., on the 30th June. Members retaining books beyond that date shall be liable to the fine mentioned in Rule 5.

8. Members who may require books to be sent to their residences shall pay all charges for carriage.

9. Members failing to comply with any of the above rules are debarred from the use of the Library.

10. The Library Committee, with consent of the Council, shall have power to add to, or otherwise modify, the above rules, as may seem expedient.

It was resolved to represent to the Director of the Ordnance Survey the desirability of undertaking a more adequate survey of the Cuillin Hills.

It was resolved to memorialise the University Court on the subject of Geographical Education.

Meeting of Council on 16th January 1902.

Mr. Robert Traill Omond, F.R.S.E., was elected a Member of the Society.

The following gentlemen were appointed Corresponding Members, viz. :—

Mr. Archibald Little, *Yangtse.*
Dr. William Hunter, *Hong-Kong.*
Rev. Thomas Lewis, *Congo.*
Rev. Friedrich Grote, M.A., *Sinai.*
Mr. Tsoi, *Hong-Kong.*

A letter was read from Mrs. A. L. Bruce's agent, transmitting a deed of gift of £1000 for the endowment of the Livingstone Medal, together with a cheque for the amount. The Council recorded its thanks to Mrs. Bruce for her generous gift, and ordered that a copy of the resolution should be forwarded to her.

Meetings in January.

On the 9th January Mr. Thomas R. Smith addressed the Society in Edinburgh, on his "Two Years' Residence in Northern China." The Chair was taken by Sir James A. Russell. Mr. Smith also addressed meetings at Dundee on the 17th and at Glasgow on the 30th. Mr. L. F. U Garriock presided at the Dundee meeting, and Mr. Robert S. Allan at that in Glasgow.

On the 23rd January, Sir Harry H. Johnston, G.C.M.G., K.C.B.,

read a paper on "The Protectorates of Great Britain in Tropical Africa," before the Society in Edinburgh. At this meeting the fund for the endowment of the Livingstone Medal was formally presented to the Society by Mrs. A. L. Bruce, and the gift was duly acknowledged by the President. The first medal was then presented by the President to Sir Harry Johnston, in recognition of his eminent services to geography. A representation of the medal appears as the frontispiece in the present number of the *Magazine*.

GEOGRAPHICAL NOTES.

EUROPE.

Changes in the Distribution of the Population in Great Britain.—M. Paul Lavagne gives a summary account, based on official and other statistics, of the changes undergone by the population of England during the nineteenth century, with special reference to the depopulation of rural districts. He points out that the figures only conform and make precise the familiar conception of the profound change which the country has undergone during the century. He believes, however, that lamentation over the change is vain, for it is a necessary outcome of a natural process of evolution. In Herbert Spencer's words, it is to be regarded only as "the continuous adjustment of the population to its new means of subsistence," and is a change which has occurred everywhere in the West, though nowhere so markedly as in England. The new conditions of existence are very different from those of former times; for to a social régime where position, wealth, and power had all a territorial origin, there has succeeded, or rather has been added, an industrial democracy which has seized the dominant rôle. This new society knows nothing of simple and natural modes of existence; life has become complex, conceptions of well-being have been raised; more and more the population tends to press towards the cities, the great centres of modern activity. In consequence of the elevation of the standard of comfort, the birth-rate has been lowered, in spite of the fertility of the race.

Nevertheless the industry which has ruined agriculture and the old crafts has not invaded the soil where these prospered; it has left the ground to those who lived upon it, if it has taken away from them the means of living there. In consequence the land is less rigorously protected than formerly, and is easily acquired by those of the nobility who have retained power and riches with their ancient privileges. In England nothing ceases suddenly, the rights of all are respected in spite of modern progress, and the result is that the inhabitants of the country districts can only persist so long as the opposing forces of the great landowners and modern industry allow them the means of subsistence. The landowners will always remain, unless the needs of modern industry demand their lands, when they themselves will become transformed into all-powerful shareholders—but soon there will be no peasants. In other words, M. Lavagne ascribes the extraordinary change which England has undergone during the last century to a dual cause, first to the great development of modern industry, and second to the pressure of the great landowners, influences which have conspired to attract rural populations to the great towns.—*Revue de Géographie*, xxv. 1901.

Glacial Deposits in Russia.—Mdlle. A. B. Missouna has studied various surface deposits in the governments of Minsk, Vilna, and Vitebsk. She finds that near the hamlet of Davgelischki there is a well-developed terminal moraine, rising in a ridge of about eighty metres in height from the surrounding sands. The sides of the ridge are formed of glacial clay, very rich in erratic blocks, and covered in places by a confused mass of angular and rounded pebbles. Beneath this superficial layer are beds of sand and stratified gravel, well seen on the summit of the ridge. This arrangement is ascribed to the pressure of the glacier, which has squeezed the clay and erratic blocks out to the sides. Later observations showed that this terminal moraine stretches, with large or small intervals, all the way from Vilna to Minsk. The moraine occupies the more elevated regions and constitutes the watershed. Between the typical morainic mounds stretches an elevated region formed of glacial clay abundantly strewn with erratic blocks. The landscape would in consequence present the appearance of a typical morainic country were it not that lakes and swamps are absent, the whole region being unusually arid. The few streams present rise from the ravines which cleave the elevated region in a perpendicular direction.—*Bulletin de la Société Impériale des Naturalistes de Moscou*, for 1900, pub. 1901, pp. 511-13.

ASIA.

Lhasa.—Colonel Sir T. H. Holdich, in *The Geographical Journal* for December, gives some account of this city and of Potala, the residence of the Dalai Lama, which is near the city, illustrated by two plans and two photographs. A Russian subject, named Baza-Bakchi, who has recently visited the district, states that the hill on which the palace and temple stand rises nearly 200 metres from the plain, but from the photograph this appears impossible, and it seems probable that the estimate of 300 ft., given by an Indian explorer called Krishna, is more likely to be correct. According to the Indian explorer, Chandra Das, the palace has nine storeys. The Lama is always a child, and is stated to be completely under the control of the Gyalpo or temporal ruler.

AFRICA.

Mapping of Africa.—In connection with the "Report on the Survey of British Protectorates" presented to the British Association at Glasgow, Colonel Sir T. H. Holdich (*The Geographical Journal*, 1901, December) gives a full account of the proposals embodied in the Report. He points out that taking those regions of Africa only which are more or less directly under the British Protectorate, there are about $2\frac{1}{2}$ millions of square miles of territory which require accurate geographical mapping for military and administrative purposes. The government surveys which have been already initiated involve, in the first instance, a "geodetic arc" to extend from the Cape to Cairo, which is to be carried out with minute accuracy. The necessary triangulation has both a purely scientific aspect, and is also intended to serve as a great continental backbone for a system of triangulation extending to all parts of Africa. But all this must be necessarily slow, and there is meantime a crying need, in the absence of a geodetic basis, for accurate geographical maps. Indeed, large areas of Africa seem adapted for "geographical" surveying only, triangulation in some cases being an impossibility. Such "geographical" maps may be defined as those in the construction of which no rigid rule of procedure can be followed, and which are independent of a geodetic basis, but which are sufficiently accurate to allow of their being subse-

quently fitted into the final framework as established by geodetic methods, without on the small scale of the map showing any perceptible error. Such maps have been found invaluable in India, as well as in America, Russia, etc., but are only possible where trained topographers are available. In Africa, both European and native topographers are required. The natives must be trained, as those of India have been trained, but as possible sources of supply for the Europeans, the author suggests the drafts of the Royal Engineers who are now being trained in military topography in South Africa—men who, though dismissed on pension from the Indian Survey Department at the age of fifty-five, are still often fit for work in the field—and others at present in Africa, who must have acquired a certain amount of skill in topography from constant practical experience. The Royal Geographical Society proposes to keep Registers of such persons, which registers will be available to those having to do with the organisation of surveys.

AMERICA.

Salt Deposit in California.—Mr. C. F. Holder describes, in the *National Geographic Magazine*, the remarkable deposit of salt at Salton, which lies in a depression almost 300 feet below the sea-level, which was formerly a continuation of the Gulf of California. The area in question is covered to a depth of 10 to 12 inches by the salt, and the method of obtaining is simply by the use of a modified plough, which throws up a ridge of salt on each side of a broad and shallow furrow. Springs of water flow into the basin, and, under the action of the hot sun, evaporate and deposit a crust of almost pure sodium chloride. As the salt is thus being continually formed anew, the danger of exhausting the supply is *nil*. Indeed, though 700 tons of salt are thrown up each day by the ploughs, only some ten acres of the deposit have as yet been worked, for these yield an apparently inexhaustible supply. The whole deposit extends over some 1000 acres.

AUSTRALASIA.

Main Range, British New Guinea.—Sir Francis Winter gives in *The Queensland Geographical Journal*, session 1900-1901, some notes of a punitive expedition into the interior of British New Guinea. At the village of Puneaburu, the party found three of the characteristic New Guinea tree-houses. The height of these from the ground does not appear to exceed sixty feet. They have a solid floor and sides built of poles, and usually a small platform in front from which missiles may be discharged. They are used only for defensive purposes, and it appears to be contrary to the etiquette of war for the attacking party to cut down the trees, even when they possess iron hatchets suited for the purpose. The party were able to some extent to examine the Domara and Adau rivers. They believe that the Domara flows into the Adau, and the Adau into the Musa, but no actual observations were made on these points.

POLAR.

New South Greenland.—Signor A. Faustini, in a communication to the *Bollettino della Società Geografica Italiana*, 1901, has some interesting remarks with respect to the projected Scottish Antarctic Expedition under Mr. W. Bruce. He notes that the area it proposes to explore lies between the 30th and 60th degree of longitude west of Greenwich, and between the 50th and 70th degree of latitude south. It is precisely in this region that the American whaling captain, Johnson, laid claim to have discovered a "New South Greenland," at latitude

67° 50′ south, and longitude 48° 10′ west of Greenwich. This was confirmed by his old companion, Benj. Morrell, who said he had coasted along the north-east side of it for over 225 km. in 1823. Is this absolutely false?

Nearly all geographers and Antarctic explorers have discredited the story of the two American whaling captains. Johnson's very existence has been questioned by Fricker. Others have compared Morrell with Robinson Crusoe and Baron Münchausen, or have taken him for a mere Yankee weaver of yarns. They base their arguments on the ground that he could not have found open sea where subsequent explorers could not pass owing to the enormous accumulation of ice. Hence he could never have reached latitude 70° 14′; nor have coasted along the land for over 225 km., as he pretends to have done, since all other ships have been stopped at the 65° parallel. On the other hand, a few geographers have taken him more seriously, supposing that his errors were mainly astronomical, and that while relating much that is improbable, yet on the whole he merits our confidence. Signor Faustini leans to this side, and maintains that the existence of the land discovered by Morrell is still really an open question. No subsequent explorer has reached a point so far south, and in the same latitude, as Morrell claims to have done. He hopes and believes it will not be difficult for Mr. Bruce's expedition to solve one of the most interesting *desiderata* of Antarctic geography in an absolute manner, and so place beyond dispute for ever the existence or non-existence of "New South Greenland," and with it the credibility or otherwise of the Yankee captain.

Abyssal Fauna of Antarctic Region. Mr. A. G. Shipley gives a useful summary of present knowledge as regards this subject. An interesting point is the fact that, as the dredgings both of the *Challenger* and of the *Valdivia* have shown, the ocean depths in the vicinity of the Antarctic are unusually rich in animal life. It would not appear that the temperature at depths over 1000 to 2000 fathoms in the Polar seas is any lower than that at similar depths elsewhere, so that the physical conditions in the great abysses are probably everywhere fairly uniform. The author then proceeds to give a general description of the peculiarities of abyssal animals, noting their uniform colours; the frequent presence of a stalk, often of a long stalk, associated no doubt with the deposits of abyssal mud; the deficiency of carbonate of lime in the shells and skeletons of the animals; the great development of tactile organs, and the great enlargement or absence of eyes. A peculiarity, as yet inadequately explained, is the modification undergone by the respiratory organs. Sometimes, as in many fish or crustaceans, there is a marked reduction in the size and number of the gills, while in other cases accessory breathing organs are developed. The second part of the paper contains a list of abyssal invertebrates known to occur in the Antarctic area. — *The Antarctic Manual*, 1901, pp. 241-75.

The Scottish Antarctic Expedition. The plans of the Scottish Antarctic Expedition are being rapidly brought to maturity, and its departure is now definitely fixed for August of this year. Mr. W. S. Bruce has been fortunate in securing a suitable ship for the work in the *Hecla* of Sandefjord, a ship which is admirably adapted in every way for the important work she has to undertake. She will shortly be brought over to this country from Norway to be refitted and overhauled on the Clyde; and it is of interest to mention in this connection, that Mr. Bruce is receiving guidance from Mr. G. L. Watson, the well-known yacht builder, and others. The ship compares favourably in size and build with the *Antarctic*, belonging to the Swedish Expedition, now on its way to the South Polar regions.

and is considerably larger than the *Belgica*, the first ship to winter on the Antarctic. She is stoutly built of pine, greenheart, beech, and oak, and has been employed up to the present in the sealing trade off the coast of Greenland. She was selected from quite a number of others, and Mr. Bruce's choice was guided largely by the advice of Dr. Nansen and Mr. Colin Archer, the builder of the *Fram*. The leader of the Expedition is at present on the Continent consulting with different European authorities on Antarctic matters, and will shortly return on board the Expedition ship, which will call in at Aberdeen, Inverness, Fort-William, and Oban, on her way to the Clyde. The ship's present name will not be retained, and one of the first changes she will undergo will be in this connection.

GENERAL.

Variation in length of Glaciers.—M. Charles Rabot has contributed to the *Archives des Sciences Physiques et Naturelles*, for 1899 and 1900, a very comprehensive paper on the subject of the glaciers of Greenland, Iceland, Jan Mayen, Spitzbergen, Franz-Joseph Land, and Scandinavia. He sums up the historical facts known in regard to these glaciers as follows:—(1) Before the eighteenth century, the glaciers covered a much less extensive area than at present, and this condition of minimum had lasted for some centuries. (2) During the eighteenth century, and in the early part of the nineteenth, the glaciers experienced an enormous increase in bulk, spreading over regions not previously invaded by ice in the present epoch. This increase was general, and affected the whole of the northern hemisphere. (3) For the greater part of the nineteenth century, the glaciers remained in an uncertain and varying state, periods of increase being followed by slight diminution. Nowhere in the north has there been the marked regression displayed by the Alpine glaciers during the last fifty years. Notwithstanding this fact, there is a certain general correspondence between the oscillations in length of the Alpine and the northern glaciers, but the increase of the latter during the eighteenth century was much greater, and their decrease during the nineteenth much less than the corresponding changes in the Swiss glaciers.

As the result of his observations on the Swiss glaciers, Professor Forel came to the conclusion: (1) that all glaciers display periodicity, the periods lasting over a long series of years, that is, ten or twenty years of increase are followed by ten or twenty years of decrease; (2) that in any country the glaciers show approximately simultaneous variations; (3) that the variations are variations of volume and not of form, that is, that the length, breadth, and thickness change at the same time and to the same extent. M. Rabot's results agree with those of Professor Forel as regards the approximately simultaneous nature of the variation, but not in respect of the other two points. In the north, there is not the prolonged periodicity seen in the Alps, for during a period of say general regression, there may be innumerable slight oscillations of amplitude. These slight oscillations are quite distinct from those due to the changing seasons. Again, in the north, it does not appear that an increase in length of the lower part of the glacier indicates an absolute increase in bulk. Indeed, an amelioration of climate, by expanding the ice, may result in an elongation of the lower glacier. Again, if the snow-field which feeds the glacier increase in size for a long period of years, and then begins to diminish, the impetus which this increase communicates to the inferior glacier may go on producing a lengthening of the latter, even after the snow-field has entered into its period of decrease. This is probably the explanation of the present oscillating movements of the northern glaciers.

Professor Norman Collie, F.R.S., lecturing before the society on December 5, described his three visits to the Rocky Mountains in 1897, 1898, and 1900. In 1900, his party made an unsuccessful attempt to climb Mount Columbia, one of the highest peaks of the Rockies, and to reach the Columbian icefield, from which issue three rivers—the Athabasca, Saskatchewan, and Columbia—which flow respectively into the Arctic, Atlantic, and Pacific Oceans. They were successful in reaching the summit of Mount Bush, which is near the icefield, and reaches a height of 11,900 ft., but had to abandon the attempt to climb Mount Columbia on account of difficulties with their packhorses and the bad weather which prevailed at the time. Mount Bush is the highest peak of the Rockies which has been climbed, in modern times at least.

Mr. Arian Hofmeyer in his address to the society on November 19, described a journey made in 1890 into Mashonaland in company with Mr. Selous and Dr. Jameson. The party penetrated as far as what is now Fort Victoria, which has now fine government buildings, a train service from Port Beira, a telegraph service, and a railway, in course of completion, to Bulawayo. At the time of the expedition the country was unknown save to a few hunters, and the pioneers had to make a road for themselves. Mr. Hofmeyer also described a journey to the Lake Ngami district, and gave an interesting account of the Kali-hari desert.

The Cocos Islands.—Mr. A. S. Baxendale gives an interesting account (*La Géographie*, iv. 1901, No. 11) of these islands and of Christmas Island. The first-named contain 655 inhabitants, of which less than a third are immigrants from Banta. They increase at about the rate of 8 per cent. per annum, the births of females being sensibly in excess of the males. The rate of infant mortality is high, this being apparently in part due to the absence of milk in the islands, and partly to neglect on the part of the mothers. Among the adults, the mortality rate is not large ; goitre, rheumatism, and tetanus are frequent, but beri-beri is rare. Education is backward, and though nominally Mahometans, the religion of the inhabitants consists chiefly in an annual visit to a mosque. From the islands about 1000 tons of copra are annually exported ; to make this quantity some 4,500,000 nuts are required. Communication with Batavia is effected every three months by the ss. *Tweed*, which belongs to the proprietor, Mr. Ross. Its return to the islands is stated to be always followed by a violent epidemic of influenza, which is unknown during the intervening months. The islands are periodically devastated by cyclones, which usually occur in December, January, and February, but in 1899 a very destructive one took place in March. Apart from these cyclones, high winds are frequent, and in consequence the temperature never rises very high. July is the coldest month, having a mean temperature of 24·7°, and December the hottest, the mean being 27·4°.

Evolution of Agriculture.—M. Henri Hitier, under this title, discusses the modifications which methods of cultivation have undergone as the result of the enormous development of means of communication during the past century. The practical result has been that the farmer no longer strives to supply directly the wants of his own and neighbouring families, but is free to specialise for the sake of distant markets. From this fact has arisen the necessity for scientific agriculture, a necessity recognised by all civilised nations, and leading to many modifications of method. One of the most striking of these is perhaps the increased substitution of mechanical for hand labour, and the use of such instruments as steam-ploughs for deep ploughing, which have greatly increased the yield in many cases. This is shown in a striking way by the fact that while in *e.g.* France and Germany, the

amount of land under cultivation for cereals has remained constant, the production has during the last thirty years greatly increased. Within the last twenty years the cultivation of the sugar-beet has made enormous strides, and its progress has been accompanied by an increased output of cattle, which can be largely fed on beet-pulp; an output justified by the fact that improved means of communication bring fresh or frozen meat within prompt reach of the consumer. There has been a similar great development in regard to dairy produce. Thus from 1880 to 1884 the yearly average of butter exported from Denmark was 10-11 millions of kilogrammes, while during 1899 the export rose to 75 millions of kilogrammes, England being a customer to the extent of 97-98 per cent. of the output. The increase was associated with great improvements in methods. The author points out that London is the great market towards which the agricultural produce of the world travels. He calculates, after M. Tisserand, that England is dependent for nine months of the year upon foreign countries for its daily bread, while France produces more than sufficient wheat to satisfy its needs, and has greatly reduced its imports of meat. But this progress has, in France, as elsewhere, produced a fall in price of the products, amounting almost to an agricultural crisis. This the author regards as only a phase in the evolution of agriculture. The remedy is to be sought in the industrialisation of agriculture—the application of the methods of modern industry and commerce—and especially in increasing specialisation. It is essential to find out what particular product a given region is best fitted to produce, and the agriculturists of the region must then combine in order to put it on the market in the most economical manner.—*Annales de Géographie*, x. (1901), pp. 385-400.

Metals used by the Ancients.—M. Berthelot has at various times published papers on his analyses of metallic objects sent to him by Egyptian and other explorers; some of his results are summed up in an article in *Nature* (vol. lxv., 1901) by Dr. J. H. Gladstone. One highly interesting fact is that the Egyptians, up to the time of the sixth dynasty, used pure copper, and after this date learned to intermix the copper with tin so as to produce a serviceable bronze. The earlier bronzes contained only about 6 per cent. of tin; at about the twelfth dynasty 10 per cent. was the usual proportion, though as much as 16 per cent. is sometimes present. Generally speaking, the metals used in early times are gold and pure copper; silver and lead are rare.

COMMERCIAL GEOGRAPHY.

Projected Railway from Lao-kay to Yun-nan-sen.—Commandant L. Schmidt contributes to the *Revue de Géographie*, November 1901, an interesting account of the province of Yun-nan, and of the possibility of connecting Yun-nan-sen by rail with the coast of Tonkin. The purpose of his paper may be regarded as threefold, for he endeavours to prove 1 that the province has resources which make it worth development, (2) that no other means of communication save that of a railway line is feasible, and 3 that a railway could be constructed without any special difficulty.

As to the resources of the province, the author admits that at present it produces but little, that in parts of the area at least it is unhealthy, and that it is ravaged by war and brigandage. But on the other hand he believes that the high land is perfectly healthy, that the province contains in addition to tin, at present worked by rude methods, mineral resources in the shape of iron, copper, and coal, and that if means of communication were available, it could export sheep and

cattle, fruits, rice, and opium, in addition to the tobacco which is exported at present. Although the transport consists only of pack-animals, there is even now a considerable amount of trade, which might be very largely increased.

The existing tracks are very bad, and the rivers are not available. The only navigable stream is the Red river, and it is broken by many rapids. Of the junks which ply between Lao-kay and Man-hao, 16 per cent. are annually lost in the rapids, and even if this difficulty of navigation could be got over, the paucity of pack-animals, and the difficulties of the roads, would greatly limit the amount of trade possible to and from the river.

As to the possibilities of railway construction, the author considers that the only possible route is that along the valley of the Red river, the route along which the existing trade is carried on. The Convention signed at Pekin on April 10, 1898, gives the French Government powers to construct a railway from Tonkin to Yun-nan-sen, and as railways are already in course of construction between Haï-phong, Hanoï, and Lao-kay, the suggested line would connect Yun-nan-sen with the coast. The conditions under which the railway has to be constructed are, that the commercial centres of Mong-tsé and Liu-gan-fou shall be served by it, that the gradients be such that a rack-and-pinion rail is not necessary, and that viaducts and tunnels be avoided as much as possible.

The preliminary survey shows that no special difficulties exist in regard to the region between Mong-tsé and Yun-nan-sen. Between Mong-tsé and the highest point of the line there is a rise of 800 metres in a distance, as the crow flies, of 145 kilometres; while from this point to Yun-nan-sen there is a difference of level of 100 metres in a distance of 70 kilometres. On the other hand, the portion between Lao-kay and Mong-tsé is much more difficult. The latter place lies in a cirque, bounded to the south by high mountains, and the difference of level between the two places is estimated at 1300 metres. It will be therefore necessary to diverge on this section in order to diminish the gradient, and the line will probably have to follow the valley of the Sin-chien-ho, a direct route being impossible.

The total length of the line would be about 475 kilometres, the longest tunnel would measure 900 metres, the widest bridge 75 metres. The chief difficulty in construction would be the feeding of the workmen, but the author thinks this could be overcome. The result, he believes, would be to divert much of the trade of Hong-Kong and Canton for the benefit of the French colony of Indo-China.

Trade of Madagascar. According to the official journal the total imports into Tamatave for the three months ending September 1901 represented a total value of 4,833,925 francs, and a gross weight of 8,574,371 kilogrammes, being an increase of 1,764,233 francs on the corresponding figures for the previous year. The returns for the quarter show that during the first nine months of 1901 the total imports were valued at 13,477,938 francs, showing an increase of 3,878,680 francs on the corresponding figures for 1900. The exports represented 1,405,928 francs, and a weight of 470,612 kilogrammes.

The ships entering and leaving the port during the quarter numbered 178, representing a tonnage of 64,860 tons. They landed 2180 passengers, and 16,259 tons of merchandise, while 1245 passengers, and 5287 tons of cargo were embarked for various ports.

Trade of British Columbia. The Board of Trade Report for 1901 shows that the mining industry has made considerable progress during the past year. The

output of lode mines has been increased by about 50 per cent. In the Skeena river division, promising gold and copper claims are being opened up, but development is retarded by the lack of adequate means of communication. Everywhere in the province minerals seem to be widely and evenly distributed, and it is probable that British Columbia will one day rank among the mineral-producing countries of the world. The output of coal from Vancouver Island has increased during the past year, about half the product having been exported to California, which has also taken a considerable amount of coke.

The salmon-fishing did not do as well as was expected, the Fraser river fisheries being seriously affected by the numerous traps employed in United States waters, where no close-time for salmon exists. The sealing catch was 35,548 skins, 37 schooners being employed.

In regard to agriculture, the prospects are promising, the established creameries, especially, having increased their output, while a number of new ones have been started.

Disappointment has been felt in regard to the delay in beginning the important lines of railway already planned. It is felt that the improvement of means of communication would greatly assist the development of the province, which contains many resources at present very inadequately utilised.

NEW BOOKS.

Aus den Hochregionen des Kaukasus. Wanderungen, Erlebnisse, Beobachtungen, von Gottfried Merzbacher. Leipsig: Verlag von Duncker und Humblot, 1901. 2 vols, with 246 Illustrations, 3 Maps. Pp. 1960.

In these two heavy volumes, weighing 12 lbs., are recorded in the utmost detail two mountaineering tours in the western and east central Caucasus in the years 1891 and 1892. Before beginning to narrate his experiences the author devotes several chapters to explain the geological structure of the Caucasus, its glaciers, as well as the hydrography of the country. In another we have a very useful summary of what is known of the principal races that inhabit the mountains. It is carefully compiled from the most recent and reliable sources, so that the facts may be depended upon. Some of the author's inferences, however, are open to doubt, as when he states his belief that the Osets have a European origin, and that the sepulchral objects from Koban and Kamunta may be attributed to that people. Nor need we give assent, as the author does, to the tradition of the Bagratide family that they descend from King David of Jerusalem, and are therefore the oldest princely family in the world.

Having thus prepared the reader, the author describes his journey with the Tyrolese guides from Munich to Svanetia, where his ascents and his troubles began. The Svanetans have never shown themselves friendly towards strangers, and they made no exception in the case of Herr Merzbacher. The porters repeatedly tried to extort money from him, and caused him every possible annoyance and provocation. No wonder that he found the Svanetans slow of apprehension and defective in their powers of judgment, though possessed of unbounded curiosity and unceasing loquacity. Though truculent in appearance, their courage is of a qualified kind, for they are in deadly terror of crossing a snow-covered glacier, and are useless for mountaineering. Their Christianity does not seem to include baptism, communion, confession, or church-services, though they have churches and occasionally sacrifice outside them.

The first essay in Caucasian climbing—the attempt to reach the summit of the Ushba—was unfortunately unsuccessful. But immediately after this the author and his party succeeded in ascending the Laila, one peak of which had not been conquered before, and the Tetnuld (4853 m.) where he remained for two hours making scientific observations. The altitudinal results he obtained agree very closely with those furnished by the general staff of the Survey of the Caucasus. Incidentally he avers that the "Gwalda Ridge" of English Alpine literature is wrongly applied, and should be the "Leksür" or "Svietgar Ridge"; and further on that Freshfield erroneously terms the Ulla-tau-tshana, the Lazga. The ascent of Elbrus (5629 m.) was made from Urusbieh, and the top reached in a tremendous storm of wind, so that it was impossible to stay there more than twenty minutes. A piece of rock on the summit had been struck by lightning and was partially melted and vitrified in consequence. The next climb to the top of the Dongus-orun was a very dangerous one, and here too it was blowing a gale, which made taking observations a painful operation. The descent was also extremely hazardous and difficult, so much so that the party was overtaken by the night and had to bivouac in the open. Turning their steps eastwards, the party next attacked the Janga Tau (5038 m.) from the north, and, in spite of being greatly hindered by very cold, stormy weather, succeeded in their efforts.

On reaching the country of the Osets the author was somewhat disillusioned, and lost some of his preconceptions about this overrated people. Their beer was abominable, the furniture of their houses poverty-stricken, and their terror at having to march over snow was as great as that of the Svanetans. As his German friend had now deserted him he had to make the ascent of the Kazbek (5043 m.) alone with the two Tyrolese. This mountain was formerly a volcano as late as the end of the tertiary or even the beginning of the quaternary period. The last climb was to the top of the Gimarai Khokh (4778 m.), a virgin peak, where it was so cold and windy that he could not light the lamp to ascertain the boiling point of the thermometer. Being unable after this to induce the Tyrolese to remain any longer in the country, Herr Merzbacher had to yield to his destiny and abandon any more mountaineering enterprise for that year.

In the autumn of 1892, accompanied by two fresh Tyrolese guides, he attacked a succession of peaks in the east centre of the main range, and ascended some of them for the first time. Among the peaks were the Tebulos Mta (4504 m.) and the Komito Tavi (4272 m.)—the latter has hitherto been known as the Katsu, Khatshos Mta, and Datakh Kort- the Donos Mta (4135 m.), Diklos Mta (4189 m.), Bogos Mta (4120 m.), or more correctly Botshokh Mta, and probably the Antshovala. On this excursion he made acquaintance with the Khevzurs, Pshavs, and Tush, all belonging to the Georgian family. In the village of Artot he saw fully a dozen dried hands of Kists hanging above the door of a tower, and it seems that such trophies of war are often to be seen in Khevzur and Tush villages. On the whole the author has little good to say of the natives; he found the Lesgians unfriendly, the Dido porters extremely lazy, and only the Tush were tolerable.

The concluding chapters give an explanation of the maps, which have been prepared with immense care; corrections of names; petrographic and palaeontological remarks on certain minerals of the Caucasus, by Dr. Ammon; and a catalogue of necessary articles for a scientific tour in the Caucasus. What is very unusual in German books, these volumes are provided with a most copious index.

The only fault one can find with this book is that it is extremely long-winded. Everything is recorded in the utmost detail; even the frequent gusts of anger that vexed the author's soul when he felt swindled out of a few roubles are conscientiously described. In other respects he shows himself an accurate and level-

headed observer in spite of a poetic nature and an enthusiastic temperament which bubble over on every page. His work will remain as a valuable addition to the literature of the Caucasus.

The Antarctic Manual. Edited by GEORGE MURRAY, F.R.S. London: The Royal Geographical Society, 1901.

The Royal Geographical Society must be congratulated for supplying a long-felt want in the form of an Antarctic Manual. Although this volume was prepared expressly for the use of the officers of the *Discovery*, and contains instructions and memoirs written for their advantage, its value is by no means a transient one. No future explorer is likely to go to the Far South without familiarising himself with its contents, and the book is bound to remain a standard work on the Antarctic. The memoirs are concisely written, and deal with a wide range of subjects, and are all from the pens of recognised experts. Here and there, perhaps, some of their instructions to the officers of the *Discovery* strike one as being wholly unnecessary, and throughout the book traces of hasty preparation betray themselves. One salient feature of the work is an exhaustive Bibliography of Antarctic Exploration, compiled by Dr. Hugh Robert Mill. The subject is treated in a thorough manner, and will be most welcome to those who interest themselves in the history of Antarctic Research.

Album de Aves Amazonicas. Organisado pelo Dr. EMILIO A. GOELDI, Director do Museu Paraense.

The fauna of the Amazonian regions is one of the richest in the world, and has been rendered famous through the researches of numerous naturalists and travellers, and especially of Spix and Martius, Johann Natterer, Count Castelnau, Alfred Russel Wallace, and Henry Walter Bates. In the published works of these authors, and in the *Proceedings* of various scientific societies, much that is of extreme interest may be gleaned concerning the beautiful and characteristic birds inhabiting the vast area drained by the mighty river and its numerous tributaries. It was not, however, until Dr. Goeldi recently gave us his work entitled *Aves do Brazil* (1894-1900) that we possessed a complete account of the remarkable avifauna of these surpassingly interesting countries.

It is to Dr. Goeldi's volumes that the *Album* under notice forms an acceptable illustrated supplement. The Fascicules before us contains twelve plates. Ten of these are devoted to aquatic species (kingfishers, herons, rails, ibises, ducks, sandpipers, gulls, etc.), which are depicted in their natural haunts on the banks and creeks of the Amazons, often amid a wealth of peculiar tropical vegetation. On the remaining plates are figured various species of those singular birds the Toucans, eminently characteristic of the ornis of the Brazilian forests. The plates are well drawn, and form attractive and instructive pictures, but, it must be said, their colouring is somewhat crude. They are calculated, however, to prove of great use to both travellers and naturalists, and enable them to identify most of the species, but in the case of others—the sandpipers, for instance—though they afford a useful clue to probabilities, yet recourse must be had to detailed descriptions ere a final decision is arrived at.

Notice sur le Bas-Congo. Annexes aux feuilles 1 à 15 de la carte de l'État Indépendant du Congo à l'échelle du 100,000e. Par HUBERT DROOGMANS, Secrétaire-Général du Département des Finances de l'État Indépendant du Congo. Bruxelles: Imprimerie Vanbuggenhoudt, 1901. Pp. xx + 301.

This volume gives a particularly interesting description of the Bas-Congo.

The map which accompanies the book is divided into fifteen sections, and the compiler treats of each section in a separate chapter, touching in a general manner upon the whole physical aspect of the country. The book has been very carefully and systematically put together, and, although the descriptions of the country which it contains are written by various people who have visited the places, it reflects great credit on M. Droogmans.

1. *D'Alger au Congo par le Tchad.* Par F. Foureau. Paris: Masson et Cie, 1902. Pp. 830.

2. *Au Congo* (1898): Impressions d'un Touriste. Par Baron E. de Mandat-Grancey. Paris: Plon, 1900. Pp. 299.

3. *Le Congo Belge:* Notes et Impressions. Par René Vauthier. Brussels: Lebègue, 1900. Pp. 237.

As the important expedition of M. Foureau was described in a special article last August (*Scottish Geographical Magazine*, vol. xvii. p. 416), we need not refer to this volume further than to say that it gives M. Foureau's Journal and numerous excellent illustrations, with a Preface by M. Louis Liard.

In the second work the author contrasts the brilliant success of the Belgians with the lamentable failure of the French in their respective colonisations of the Congo, and attributes the success of the former to the ability, authority, and devotion of the King of the Belgians in directing and controlling the enterprise.

In the third volume (which is nicely illustrated) the author describes the opening of the railway from Matadi to Stanley Pool, and afterwards an excursion, arranged by the State, to Stanley Falls.

Burma under British Rule—and Before. By John Nisbet, D.Œ.C., late Conservator of Forests, Burma, etc. 2 vols. Westminster: Archibald Constable and Co., 1901.

Mr. Nisbet, whose works on forestry are well known to readers interested in the improvement and development of the home lands, has in these two solid volumes laid before us a comprehensive treatise on a remote and rich province of our Indian Empire with large capabilities for development and commercial enterprise. This is the first non-official work on Upper Burma which deals comprehensively with the past history, present condition, and future prospects of the country, and the author has spared no pains to make the book complete and up to date in every department. In the first volume, six chapters are given to the historical part of the subject, culminating in an account of the inglorious and bloodthirsty reign of Thibaw Min, his deposition in the end of 1885, and the subsequent pacification of Upper Burma, which was completed four years later. The country became settled and safe from the raiding dacoits in 1890, and after British rule was completely established, it was possible to begin the work of regular administration and the construction of highways, by which the resources of the surrounding region could be made available. Since then the progress of Upper Burma has been steady, if not very rapid, and the author gives statistics of the trade of the country during the last ten years, the finances, and the growth of the population, all of which show the advantages the Burmese people derive from the strong and beneficent rule of the British Raj. Although coal, gold, and other minerals have been mined in Burma, and petroleum is produced in considerable quantities, the country is important chiefly as an agricultural region, eminently

suited for the cultivation of rice and the growth of teak and other forest products. Rice has long been, and, as the author says, will always continue to be, the great staple export from Burma. In 1889 a little over a million tons were exported, while for the first ten months of 1900 this quantity was almost doubled. The area under cultivation has expanded greatly, but there are still vast tracts suitable for permanent cultivation, whenever the population has increased sufficiently to provide the necessary labour for breaking up new ground. About 8,000,000 acres are cropped in Upper and Lower Burma, and more than 24,000,000 acres of waste ground still remain available for rice-growing, equal to more than three-fourths of the total area of England. Next to rice, the principal Burmese export is teak. The total value of this in 1893-94 was £841,226, and in 1900, £1,524,797—a gratifying increase productive of large profits to the Government as well as the timber companies concerned. During the eleven years from 1888-89 onwards, the volume of imports has increased from $6\frac{1}{4}$ to $8\frac{1}{3}$ millions, and that of the exports from $5\frac{1}{2}$ to $12\frac{1}{2}$ million pounds. The total imports and exports rose from £11,717,067 in 1889 to £20,819,992 in 1890, the great bulk of the trade being conveyed in British ships. Under the old Burmese system, any one reputed to be wealthy was liable to oppression (as he is in the Turkish Empire to-day), but now a new social system is springing up, under which wealth is beginning to be held in estimation, and the owners need not fear to show it. The country is but thinly populated, and has therefore ample room for new inhabitants, who are flocking in from India and China in large numbers. By the end of the century the old social system will have almost disappeared, and a new race will inhabit Burma, descended, probably, from the active and capable Chinese immigrants who have married industrious Burmese wives, and generally make far better husbands than the indolent, easy-going gentlemen of their own race. The trade of Burma was formerly largely in the hands of Scotsmen, but of recent years the influence of German firms has become preponderatingly great. The author points out as the reason for this supplanting of the Scottish pioneers, that the assistants in the German firms come out better equipped for their work, although they can neither ride nor play cricket and tennis. They think more of business and less of amusement, and, by sheer assiduity, acquire an earlier and often better acquaintance with Hindustani and sometimes also of Burmese for business purposes, although not naturally better linguists than the British.

These admirable volumes will for a long time hold the first place among books on Burma, and may be recommended to the study of all who are interested in the history of our Eastern Empire, or are on the outlook for new fields for commercial enterprise in that region.

Prospecting for Gold. By Daniel J. Rankin. London : Crosby Lockwood and Son, 1901.

This little book contains in small compass a great deal of extremely useful information for those in quest of the precious metal. It deals with the geology and mineralogy of rocks associated with gold, and tells the novice how to dolly and pan and analyse with the blow-pipe in the field, far from civilisation. The second part consists mainly of tables giving the physical and chemical characters of ores of iron, copper, silver, gold, and other metals, and the methods of detecting their presence with the blow-pipe. The author has compiled a large tabular view of the characters of thirty-three mineral ores associated with gold, which shows at a glance how any common ore in the category can be distinguished. The booklet is well got up—needlessly so, as handsome red leather and gilt edges will not have

much respect paid them in a miner's dirty hands—and can be confidently recommended as part of the kit of any intelligent, educated prospector in search of the yellow metal.

The Mediterranean Race. A study of the origin of European Peoples. By G. Sergi. London: Walter Scott, 1901. *Price* 6*s.*

The volume now before us is the latest publication of the "Contemporary Science" series, and is calculated to evoke no small amount of controversy and opposition from anthropologists and ethnologists of the Old School, who still are wedded to the theory that Europe was civilised by Aryans from Asia. It is from the learned pen of Signor Sergi, the distinguished Professor of Anthropology in Rome, who in his preface lays down the propositions he maintains, viz., "the primitive populations of Europe, after *Homo Neanderthalensis*, originated in Africa; these constituted the entire population of Neolithic times; the basin of the Mediterranean was the chief centre of movement whence the African migrations reached the centre and the north of Europe; from the great African stock were formed three varieties, in accordance with differing telluric and geographic conditions, one peculiarly African remaining in the continent where it originated, another the Mediterranean, which occupied the basin of that sea, and a third, the Nordic, which reached the north of Europe; these three human varieties have nothing in common with the so-called Aryan races, . . . the Aryans are of Asiatic origin and constitute a variety of Eurasiatic species; the physical characters of these skeletons are different from those of the Eurafricans; the primitive civilisation of the Eurafricans is Afro-Mediterranean, becoming eventually Afro-European; the Mycenæan civilisation had its origin in Asia, and was transformed by diffusion in the Mediterranean; the two classic civilisations, Greek and Latin, were not Aryan but Mediterranean. The Aryans were savages when they entered Europe; they destroyed in part the superior civilisation of the Neolithic populations, and could not have created the Greco-Latin civilisation; in the course of the Aryan invasions the languages of the Eurafrican species were transformed in Italy, Greece, and elsewhere, Celtic, German, Slavonic, etc., being genuine branches of the Aryan tongue; in other cases the Aryan languages underwent a transformation, preserving some elements of the conquered tongues as in the Neo-Celtic of Wales." Obviously it is impossible for us even to condense the arguments on which these novel propositions are based. It is not to be expected that the supporters of the Aryan civilisation theory will find them convincing, but at any rate they are set forth with much confidence and supported by much profound learning and observation, to controvert which will be no easy task.

Sands of Sahara. By Maxwell Sommerville, Professor of Egyptology, University of Pennsylvania, Philadelphia. London: J. A. Lippincott Company, 1901. *Price* 10*s.* 6*d.*

This book gives an account of an expedition into the "Sands of Sahara," viz., from Algiers to Tugurt and its vicinity, for the purpose of collecting talismans, of which Professor Sommerville succeeded in procuring a miscellaneous assortment, including several donkeys' feet, Fatima's hands, bones, eggshells, teeth, and the like, which are now on view in the Free Museum of Science and Art in the University of Pennsylvania. The object of the expedition appeals to but a limited number of students in this country, but many of the numerous illustrations of the book are excellent, and worth inspection as views of desert scenery and life.

The Log of an Island Wanderer: Notes of Travel in the Eastern Pacific. By Edwin Pollander. London: C. Arthur Pearson, 1901. Pp. 320. *Price 6s.*

A rollicking, but interesting, account of "a charming summer spent in the isles and enchanted gardens of Australasia." The author tells us that fifty years ago Cotton was the mainstay of Tahiti, Raiatea, and the Marquesas group. Now it is "a thing of the past," Vanilla having taken its place and being with Copra (the dried kernel of the coco-nut) the principal resource of the Tahitian peasantry. He adds that Copra is chiefly used for making railway-grease, but that it can be turned into any kind of oil. There are thirty-two excellent illustrations in this volume, but there is no map.

The Northern Highlands (Scotland, Part II.). By M. J. B. Baddeley. Maps by Bartholomew. Sixth Edition. London: Dulan and Co., 1901.

This little book forms part of the "Thorough Guide" Series. The practised hand of the experienced guide is evident in every page. The descriptions of Inverness, Strathpeffer, Gairloch, the Loch Maree district, and Lochinvar are more fully detailed than in the previous editions. The maps are excellent. Travellers are sure to find this new edition an acquisition.

An Essay on Western Civilisation in its Economic Aspects (Mediæval and Modern Times). By W. Cunningham, D.D., LL.D. Cambridge: At the University Press, 1900. Pp. xii+300. *Price 4s. 6d.* ("Cambridge Historical Series.")

"There have been three great stages of progress in man's knowledge of *himself* and of his *place* and *powers* in the world, and each of these has had far-reaching effects on industrial and social life" (p. 15): first, the period of Christian influence, through which man attained a new consciousness of duty; second, the period of discovery, with an expansion of man's knowledge and of man's interests; third, the period of inventions, with an increase of man's mastery over physical nature. Each of these ages and processes has had its economic and political conditions, workings, and effects. In the history, or an attempted examination of practice—social, national, international—it is impossible or unwise to isolate a set of conditions and facts, and mark them as purely economic. Dr. Cunningham has produced a compact, carefully-reasoned, well-informed work on a great subject, and the basis of his successful effort is laid in his grasp of the interaction of social forces, and in his wide and thorough knowledge of the growth and perils of peoples and states. The present volume is concerned mainly with mediæval and modern times, and follows on another published three years ago, dealing with ancient society and civilisation; but, as in the earlier volume, there are inquiries, essential and incidental, into the foundations of society and of progress, and they are conducted by a mind eminently qualified to elucidate and to enforce. Without disparagement to the worth of the companion-volumes of the "Cambridge Historical Series," we may question whether Dr. Cunningham's work would not have been better presented independently, and perhaps on a larger page, and with larger type.

First on the Antarctic Continent: Being an account of the British Antarctic Expedition, 1898-1900. By C. E. Borchgrevink. London: G. Newnes, 1901.

In this volume Mr. C. E. Borchgrevink gives an account of his expedition to the Antarctic regions from 1898 to 1900. In the preface Mr. Borchgrevink says

that "this expedition was carried to a successful termination." The book, however, does not give one this impression, though it is to be hoped that when the results of the expedition are fully published, we may be able to acquiesce in this statement. The chief work done appears to have been in the neighbourhood of Cape Adare and Robertson Bay, the coast-line of which appears to have been well surveyed by Lieut. Colbeck. The meteorological, magnetical, and astronomical observations will also probably form a valuable addition to our knowledge of the Antarctic regions, and emphasise more and more the importance of developing especially in all expeditions station work from a base on land. From the description and maps of this land by Sir James Ross, it was scarcely to be expected that the expedition would be able to penetrate far inland, having first to overcome the difficulties of a range of mountains 10,000 feet in height. The explorers went through the usual hardships of a Polar winter, where lack of sun cold, and generally dirty weather made things uncomfortable and trying. We could have wished for greater accuracy in the volume in purely scientific statements, and Mr. Borchgrevink might have done well to have intrusted these to a scientific man. Comment has been made elsewhere on this point in regard to physical observations, and it is unnecessary to repeat the remarks here. The general statement that bipolarity was proved will not satisfy the biologist. Extensive and detailed examination of many collections and much comparative work in both north and south must still be undertaken to solve this important problem. Generic and specific names are used in too loose a manner even for a book evidently intended only to be popular. To be popular it is not necessary to be inaccurate.

From February 3rd to 26th a rapid trip was made along the east coast of Victoria Land and to Cape Crozier, and thence to the east end of the barrier and back again past Cape Adare. Practically no additional information was added, however, to our knowledge of this region south of 75° S. Mr. Borchgrevink says, "Valuable photos of Mounts Erebus and Terror" were secured, but unfortunately he does not publish them; we trust he will yet do so at an early date; we would like to see through the camera's eye these interesting mountains. No photograph of importance, except one of Cape Crozier, are in fact given south of 75° S. On the 16th of February Mr. Borchgrevink with Lieut. Colbeck and a Finn landed on a low part of the barrier in a bay, and travelled sixteen miles inland on the ice. This journey is very briefly described, and we learn little about the nature of the ice they travelled over. Three simple and clear maps appear at the end of the volume. To Sir George Newnes belongs the credit of financing the expedition; science has to thank such enthusiasts for their munificence.

En Indo-Chine, 1896-1897: Tonquin, Haut Laos, Annam Septentrional. Par Le Marquis de Barthélemy. Paris: Plon-Nourrit et Cie, 1901. Pp. 375, with 20 Illustrations and 5 Maps.

This is the second volume of a trilogy on Indo-China, embracing the observations of a careful investigator in the course of a somewhat leisurely journey through the regions indicated in the sub-title. Possibly the most valuable part of the book is the itinerary printed as an appendix. It consists of topographical details entered at intervals often of ten minutes, so that the reader is not only able to see the difficulties, characteristics, and extent of each day's travel within a short compass, but is enabled to judge accurately the distance between the successive points by a time standard, which is incomparably more useful than mere mileage. The text comprises pages of luminous description, pointed by occasional sedate reflec-

tions. The work, when completed, will prove a most valuable contribution to the geographical literature of Indo-China.

Primitive Man. Translated from the German of Dr. Moriz Hoernes by James H. Loewe. ("The Temple Primers.") Pp. viii + 135.

Within a small compass we are here given an excellent *résumé* of the present knowledge of Primitive Man. The size of the book prevents the author offering more than the best ascertained results, but the facts are marshalled and detailed with the ease and ability of the expert. The translation is apparently faithful, although the use of certain words, and more especially the notes added by the translator suggest that he has little or no first-hand acquaintance with the subjects he would elucidate. Some fifty well-executed illustrations add to the value of the book.

Samarkand: La Bien Gardée. Par A. Durrieux et R. Fauvelle. Paris: Plon-Nourrit et Cie, 1901. Pp. vii + 304, with 23 Illustrations.

This volume contains a series of interesting studies in Transcaspia, possibly the least-known territory in the Empire of the Tsar. The book opens on the western shore of the Caspian Sea, but in the description of Baku and the petroleum industry, little really fresh information is imparted. The strength of the book lies in the chapters on Samarkand and Bokhara, about which wonderfully little reliable information is yet available to English readers. The facts that Samarkand, thanks to the railway, is now but three days from the Caspian, that additional railroads are being planned and constructed in Turkestan, and that the Russian outposts are now but 24 kilometres from Herat, lead the writers into a disquisition in the final chapter on the future *rôles* of Russia and Great Britain in this part of the world. They consider that the commercial success of Russia in Central Asia is "very probable"; her political triumph is still less a matter of doubt. "Infallibly Persia and Afghanistan will one day or other fall under the authority of the Tsars; thereafter the destinies of India will be in their hands." The discussion of this immense question in possiblities rather than probabilities, together with their notes on the military situation not only in Turkestan but in India, make thoughtful reading for those who have the interests of our Empire at heart.

Botany of the Faroes based upon Danish Investigations. Part I. Illustrated with 10 plates, and 50 figures in the text. (Published by aid of the Carlsberg Fund.) Copenhagen: Det Nordiske Forlag. London: John Wheldon and Co., 1901. Pp. 338.

This first part of the Botany of the Faroes is written by various authors. It contains a splendid description of the geography, topography, industrial conditions, geology, and climate of the Islands, brought together in a scholarly fashion. The plates and figures are very good, and should add considerably to the success of the book.

A Short History of the English Colonies. By Agnes F. Dodd. London: J. M. Dent and Co., 1901. Pp. 222.

This is a very concise little history of the English Colonies. In a brief manner it supplies a clear outline of the history of our Colonies, from the time of Elizabeth to the present day. The book should not only be of value to students, but the great body of the uninformed educated may gain much desirable knowledge from its perusal. It is illustrated by uncoloured maps.

The New Brazil: its Resources and Attractions, Historical, Descriptive, and Industrial. By MARIE ROBINSON WRIGHT. Philadelphia: George Barrie and Son. London: C. D. Cazenove and Son. Paris: 19 Rue Scribe. Pp. 450.

This finely illustrated book contains an exceedingly good description of the history, natural resources, climate, and manufactures of Brazil, from its discovery by the Portuguese navigator, Pedro Alvares Cabral. It shows the wonderful growth and development of the country, from insignificance to a state of importance amongst the nations of the world. The author gives a good account of the inexhaustible stores of mineral wealth, and of the fertility of the soil, facts that have been recognised by eminent geologists and botanists. The work also enters into the social and political development of the country. As no recent works on Brazil have been published, this should prove an attractive book.

The Story of Newfoundland. By F. E. SMITH, formerly Fellow of Merton College, Oxford. ("The Story of the Empire" Series.) London: Horace Marshall and Son, N.D. Pp. 133. *Price* 1*s.* 6*d.*

This interesting little work gives a concise account of Newfoundland from its discovery. The author gives a vivid description of the inhabitants, their customs, and their form of government, and devotes a chapter to the famous *Reid Contract.* The book is sure to afford pleasurable reading to all interested in our Colonies. Two good maps complete the work.

New Zealand: Notes on its Geography, Statistics, Land-System, Scenery, Sport, and the Maori Race. By R. A. LOUGHNAN. Wellington, N.Z.: By authority, John Mackay, Government Printer, 1901. Pp. 110, Preface and Index.

The author of this well-illustrated little book says that he has written it with a double purpose—"To give (1) some idea of how the New Zealand community stand after ten years of advanced legislation, and (2) a bird's-eye view of the land they live in." He has succeeded well in his purpose, and has compiled an exceedingly interesting volume, which should create an interest in the Maori Race, and, by his descriptions of its beauty, climate, and sport, attract visitors to the country.

Die geographische Verbreitung der Vulkane. Mit zwei Karten. Von DR. CARL WÄGLER. Leipzig: Duncker und Humblot, 1901.

This little book is comprised of two good maps, showing the distribution of the Volcanoes in the world, and a short text which serves as reference to the maps. The text is carefully written, and very concise.

Sfere Terrestri e Celesti, di Autore Italiano oppure fatte o conservate in Italia. Per MATTEO FIORINI. Roma: Presso la Società Geografica Italiana. Pp. 502. *Price L.*6.

This gives an account of all the well-known Terrestrial and Celestial Globes which have been made in Italy, or are to be found in Italy at the present day. Of all countries in the world, Italy is, without exception, the richest in historical globes. Its palaces, libraries, and museums abound with them, and Professor Fiorini, with the help of the Italian Geographical Society, has done a great service to geography in publishing this carefully compiled description of them. In a chronological list of the most famous globes in the world, out of 286, no less than 181 are Italian, and among them are the celestial sphere of Archimedes, the terrestrial globes of

Toscanelli, Bartholomew Columbus, and Coronelli, besides examples of the best known foreign ones—Schöner, Blaeuw, and Newton. Professor Fiorini's work forms a most valuable contribution to the history of Cartography.

Maps, their Uses and Construction. By G. James Morrison, M.I.C.E., F.R.G.S. London : Edward Stanford, 1901. Pp. 110. *Price 5s. net.*

In no department of the geographical literature of this country is our poverty more evident than in Mathematical Geography. It is probably no exaggeration to say that there are probably fifty German books on Map Projections to one in English. Unfortunately the present volume cannot be said to meet the long-felt want of a practical English work on the subject. Mr. Morrison's work is general and elementary, and while it is good so far as it goes, it is to be regretted that it did not go just a little further and include sufficient detail to be of real practical use.

Guide to Italy. With Maps and Plans. London : Macmillan and Co., Limited. Pp. ciii + 351. *Price 10s. net.*

This is the first volume of Macmillan's Guides, a new series which does not pretend to the completeness of the practical *Baedeker*, or the scholarly thoroughness of the more cultured *Murray*. For, while Baedeker devotes three volumes to Italy, and Murray gives it no less than five, Macmillan finishes it off in one. It is therefore evident that this series is primarily designed for the tourist who wishes to rush round in a very limited time. The result is extreme condensation, with consequent meagreness of description. But the plan of the book is excellent, and presents distinct advantages for reference. A series of routes is given in Part I., dealing simply with locomotion, distance, and scenery *en route*, and along the routes the places which are worthy of notice are printed in black type. Part II. consists of a sort of tourist's descriptive gazetteer, giving in alphabetical order all the places of interest, including all those printed in black type in the route surveys. The hotels are given separately in a supplement. There are also special introductory articles by specialists—"Italian Art" by R. E. Fry, "Architecture" by P. Waterhouse, and "Aspects of Modern Italy" by Oscar Browning. There is a liberal allowance of maps and plans, but they are poor in execution, and anything but clear for reference.

NEW MAPS.

EUROPE.

ORDNANCE SURVEY OF SCOTLAND.—Publications issued from 1st to 31st December 1901 :—Parish Maps (Scale 1 : 2500, Revised, with Houses ruled, and with areas. Price 3s. each). *Aberdeenshire.*—Sheets xi. 5, 6, 7, 8, 9, 13, 14 ; xii. 5, 6, 7, 10, 11, 12, 13, 14 ; xiii. 13 ; xviii. 3, 4, 8, 10, 12, 15, 16 ; xix. 9, 13 ; xx. 4 ; xxi. 1 ; xxvii. 2, 3, 4 ; xxxiii. 15 ; xxxiv. 13 ; lxxv. 7 ; lxxxix. 15 ; xc. 7, 8, 11, 12, 14 ; xci. 7 ; xcviii. 1, 2, 3, 4, 5, 6. *Banffshire.*—Sheets xxviii. 3, 4 ; xl. 15 ; xli. 1, 2, 9, 10. *Forfarshire.*—Sheet xxxvi. 12. *Inverness-shire.*—Sheets xlvi. 7 ; xlvia. 1, 9, 13. *Orkney.*—Sheets lxxv. 14, 15, 16 ; lxxvi. 13 ; lxxvii. 15, 16 ; lxxviii. 13 ; lxxix. 3, 4 ; lxxx. 1, 5, 6, 9, 13, 15, 16 ; lxxxi. 4, 7, 14, 15, 16 ; lxxxii. 1, 2, 5, 6, 9 ; lxxxvi. 3, 4, 8. Note.—There is no coloured edition of these Sheets, and the unrevised impressions are withdrawn from sale.

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Catalogue of the Ordnance Survey Publications of Scotland, revised and corrected to the 1st January 1901. This is the last edition issued ; but a new edition is in progress.

Published at the Ordnance Survey Office, Southampton.

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PLAN OF LIVERPOOL. By John Bartholomew, F.R.G.S. Scale six inches to a mile. New and Revised Edition, 1901. With Index to Streets and Public Buildings. *Price 1s., or 2s. mounted on cloth and in case.*

W. H. Smith and Son, London.

AMERICA.

AMAZONAS. Mappa geographico do Estado do ——. Organizado por Ermanno Stradelli de accordo com suas Notas e Exploraçoes e baseado nos melhores mappas. 1901. Escala 1 : 2,222,000.

Presented by the Società Geografica Italiana, Roma.

This is a new map of the State of Amazonas of the United States of Brazil. Although a somewhat crude piece of cartography, it is from the latest sources, and represents about all that we know of that almost unexplored state which is nearly as large as Central Europe. In view of the French claims on Brazilian territory it will be of special use at the present time.

UNITED STATES. Rand, M'Nally and Co.'s Indexed County and Township Pocket Maps,—Connecticut, Florida, Cuba. 1901. *25 Cents each.*

Rand, M'Nally & Co., Chicago and New York.

AFRICA.

EGYPTIAN SUDAN. War Office Map of Africa. Scale 1 : 250,000, or about four miles to an inch. 1901. District Sheets—Fashoda, Shabluka, Shendi, Atbara, Beni Shangul, Fazogli, Keili, Abba Island, Jebelein, Kagmar, El Obeid, Ma'atuk. Reproduced from Maps supplied by the Director of Sudan Surveys. *Price 2s. 6d. each.* *Intelligence Division War Office.*

These sheets are evidence of the rapid progress now being made with this important new map.

WEST AFRICA. Maps of Country between Red and White Volta Rivers. Reproduced from Surveys executed by the Anglo-French Boundary Commission, 1900. Scale 1 : 50,000. 5 Sheets.
Intelligence Division War Office, 1901.

NEW ATLASES.

GROSSER DEUTSCHER KOLONIAL ATLAS. Bearbeitet von Paul Sprigade und Max Moisel. Herausgegeben von der Kolonial-Abteilung des auswärtigen Amts. Lief. 1, Kamerun in 6 Blättern. 1901. *Price* 6 *M. or* 1 *Mark per sheet.*
Dietrich Reimer (Ernst Vohsen), Berlin.

Germany is already rich in colonial atlases, but of late there has been great activity in exploring and surveying. The present atlas, which is on a larger scale and more comprehensive than any hitherto attempted, is issued by the German Colonial Office. It is to consist of thirty sheets of maps on the uniform scale of 1 : 1,000,000, compiled from the very latest material and accompanied by descriptive text. The first part deals with the Kamerun Colony in six sheets, and is the most authoritative map of that region.

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United Free Church Foreign Mission Office, Edinburgh.

This is a useful little atlas showing all the Foreign Mission fields and stations of the United Free Church of Scotland. The maps are by Bartholomew, and are clear and effective.

COLONIES FRANCAISES. Atlas des — —. Dressé par ordre du ministère des Colonies par Paul Pelet. Livraison 8. 1901. *Price* 3 *francs.*
Librairie Armand Colin, Paris.

An excellent map of "Indo-Chine Française" on scale of 1 : 2,500,000, and another of "Afrique Occidentale" on scale of 1 : 3,000,000, are contained in this part. They are the latest and best general maps of these countries at present published.

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This atlas was specially noticed on pages 34 to 39 in the January *Magazine.*

THE TWENTIETH CENTURY CITIZEN'S ATLAS, containing 156 pages of Maps and Plans, with an Index, a Gazetteer, and Geographical Statistics. In 26 parts. Edited by J. G. Bartholomew. Parts 3, 4, 5, 6, 7, and 8. *Price* 6*d. each part.* *George Newnes, Limited, London.*

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Kathakatenka
RES
GOR
Gor
PITAN
Pitan
SIBA
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Lahor
Multan
Indus flumen
Ganges flu.
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Macao
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Iava Minor
Borneo
Philippinae Insulae
Moluccae Insulae
Nouae Guineae pars
Nouae Hollandiae pars
Terra Australis
Mare del Zur
Mare Pacificum
Mare del Sur
Mare del Norte
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Fretum Quiuira
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Fretum Nouae Zemblae
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Fretum Petzora
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Fretum Nouae Zemblae
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THE SCOTTISH GEOGRAPHICAL MAGAZINE.

THE IMPORTANCE OF GEOGRAPHY IN EDUCATION.[1]

By the Right Hon. James Bryce, M.P.

When my friend the Chairman asked me to give you an address, I felt some diffidence in doing so, because I know that members of the Geographical Association are themselves persons for the most part possessing a practical acquaintance with the subject much greater than I could lay claim to, and I always feel that it is dangerous for an amateur to give an address to specialists. I consented, however, chiefly because the occasion gave me an opportunity of expressing the very warm interest which I feel in the work of your association, and my hearty sympathy with it. Nothing has been more wanted for a long time than that an association of this kind should exist for pressing upon the public a knowledge of what its real interests in geographical teaching are, and for that reason I very gladly consented to say what I had to say to you. I cannot hope to say anything novel to those who are familiar with the subject, but I may perhaps attempt to lay before you a few considerations which bear upon its wider aspects, and which are chiefly suggested by observations that have occurred to me in the course of travel in different parts of the world.

The place of geography in education may be considered under three aspects, and I will distinguish those three aspects by the shortest phrases I can find. Geography in one aspect or sense is the gateway to the physical sciences; in the second aspect it is the key to history; and in the third it is the basis of commerce. These three aspects in which it may be regarded correspond to the different parts of school, college, and university work, and they have to be carried out and conducted to a con-

[1] Address delivered at the Annual Meeting of the Geographical Association, 15th January 1902, with Mr. Douglas Freshfield, President, in the Chair.—Printed by permission of the Association.

siderable extent by a different part of the educational staff of a school, college, or university, and yet each of the three has very important relations to all the others. Though this is especially true with regard to the first two, the third is also in intimate relation with the others. He who wishes to understand geography in any one of these three aspects, ought to know something about it in the other two aspects; and he will find what he knows about it in any one of the aspects, of which the first is after all the most fundamental, will help him to comprehend and to apply his knowledge in the other two.

Let me begin with geography as what I have called the gateway of science. We may say that man touches nature, the external world of nature, in two points. First of all he touches it through the constitution of his own physical body. As possessing a body he is himself part of nature, and he comes into relations with it through that body. The study of these relations belong to the sciences which we call physiology and biology. Then he also touches it through the external world, the phenomena of which he learns through his senses, and in which he is placed to do his work. Geography may be described as being the general science of the Earth, perhaps I ought to say, of the Earth as a part of and affected by other parts of the material universe, but in the first instance, and for our more immediate purpose, of the Earth which we inhabit. Geography is the science which takes for its province the describing to us everything that relates to the Earth.

All branches of knowledge which have anything to tell us about the Earth more or less hinge into or are connected with geography, or you may, if you like, say they diverge from it as specialised departments of that general knowledge which it presents in its connection with the whole. For instance, geography takes account of the solid crust of the Earth. The solid crust of the Earth is the special subject of three sciences—geology, mineralogy, and palæontology—which therefore diverge from geography as being specialised branches of the science which it presents in a general way. Then you have a second divergent branch in meteorology and oceanology, dealing with the phenomena of the air and vapour, and the closely cognate phenomena of the great masses of condensed vapour which exist on the surface of the Earth in the form of oceans. A third branch is that represented by the sciences of botany and zoology, describing the living creatures which find their home and their sustenance on the Earth. A fourth, a little more remote, consists of the sciences of physics and chemistry, which again deal with the constituents of the globe and of the forces which move them—the forces which you see in operation through the Earth which belong to physics, and the study of the constituent elements of the Earth, the methods by which they are analysed, and the combinations which they form, which constitute the science we call chemistry. Even astronomy, although it carries us beyond the limits of our terrestrial globe, is really closely connected with the science of the Earth, inasmuch as many terrestrial phenomena are sensibly affected by phenomena which lie beyond the globe, and cannot be understood without a comprehension of astronomy also.

The whole of this great group of physical sciences, each of them re-divided and specialised into numerous branches and departments, springs from geography as the centre of the group. Physical geography, in particular, shows the relation which each of these branches of science bears to the others, and the way in which, all taken together, they have their influence upon the life and development of man. One may figure the thing by saying that geography is a sort of great central hall from which there open out numerous doors leading into apartments, each of these being dedicated to some particular one of the sciences which are connected with the Earth and its phenomena. All the apartments find their meeting-point, their point of convergence, the place through which the student must pass from the one to the other, in the science of geography which stands in relation to them all alike (or almost alike). Therefore, in this sense, you may say that geography constitutes the approach to all the physical sciences. It is the science which brings them all into correlation with one another; it is the science through which you can best observe the action of each of them upon the life of man. Thus it holds a highly significant place in education. Students who are going to devote their attention mainly to the physical sciences find geography a starting-point; it indicates the relations of the sciences to one another, for all are connected with the external nature in the midst of which we stand.

Students who are not going to devote their attention to the natural sciences, but to what are called the human subjects—literature, history, philology, economics, and so forth—again find in geography the point in which these subjects have their contact with the physical sciences. If such students are given, at the starting of their career, a due comprehension of the numerous bearings and relations which geography has to all the other sciences that deal with physical phenomena, they are better able to go off into those special human branches of study which they intend to pursue, having gathered the relation which they all, through geography, bear to physical science.

That is the first point in which I venture to think you may claim for your science an exceedingly important part in the general scheme of education. It gives the student a proper conception of the relation of the sciences of nature to the sciences of man, and it shows how the different sciences of nature are related to one another.

Further, geography, and more particularly physical geography upon its practical side, becomes of the greatest value as a training in the art of observation. Physical geography, like other kinds of geography, used to be taught mainly out of books, and the pupil was allowed to have very slight contact with facts which he can see for himself. Happily all that has been changed, and I am glad to know that now in this country, as has for some time past been the case in Germany, it is thoroughly realised by all progressive teachers that geography must be made as much as possible an experimental science—experimental in this sense, that the pupils' minds must be brought into contact with facts and not words, that they must be taught to connect what they read and what they hear from their teachers with the actual facts they are trained to observe for

themselves. All competent teachers of geography have now begun to feel that they ought to start out by giving the scholar a direct personal knowledge, and not a mere book knowledge of the meaning of geographical terms and the elementary data of physical geography; that he ought to be taken round the place in which he lives; that he ought to be shown hills, or mountains, if he is fortunate enough to have mountains in his neighbourhood, and notice the rocks they are made of; that he ought to be taught to observe the course of rivers and brooks; that he ought to be led to study the inclinations of hills and the structure and features of an undulating country, or of plateaus or of riverine plains; that he ought to be taught to observe the trees and the vegetation generally which appertain to particular kinds of soil, or to particular exposures; and to keep his eyes open and his memory alert to watch the winds and the rainfall, and to acquire a knowledge of the climate of the region in which he lives. All these things about which he reads in his text-books of physical geography, ought to be made real and vital and full of meaning to himself, by being connected with the actual facts which he can note and remember when they are shown him, but will probably not notice unless they are pointed out to him. He lives among them, but he may never observe them (unless he is an exceptional boy), until his attention is called to them. Physical geography, communicated in that way by an active-minded and intelligent teacher, becomes one of the best possible of trainings in the art of observation, an art which might appear easy and natural, but which in reality requires a good deal of training, because no one knows, until some incident calls his attention to it, how many of the phenomena among which he moves he has failed to observe.

Thirdly, from observation the study of geography passes into the stage of reflection and combination, that is to say, these phenomena which have been made real to the pupil by his being taught to observe them, have to be suggested to him as subjects for inquiry and brought into a casual relation with one another in order that he may ask himself, What has been the source of these facts I see in external nature, and how are they connected with one another? He must be taught whenever he is shown a fact in physical geography to inquire into the cause, and whenever there are two facts, to ask what relation, if any, there is between them. What connection, for instance, is there between the inclination of the hills, whether gentle or steep, in a mountainous district and the character of the rocks and amount of rainfall in that district? What connection is there between the growth of trees and the rainfall and the prevalent winds? In that way physical geography will teach the pupil to acquire the habit of looking at a region as a whole, so that when there is any district which he has got to know by his own observation he will begin to reflect and seek to discover what have been the physical causes which have gone to make this district what it is, and what relation exists between those various causes.

It is extraordinary how little most of us will observe of these matters if we are left to ourselves. Ask yourselves how many people among your acquaintance there are who have any intelligent knowledge

of the weather, that is to say, who are in the habit of observing the direction from which winds come, and the phenomena of the sky which indicate fair weather or dull weather or rain respectively? You will find, I think, they are extremely few. It is a rare thing to meet even a man living in the country who has made an intelligent study of the weather and who constantly observes the winds, who knows from what kind of wind and from what aspects of the sky certain weather may or may not be expected. Of course we all know that the predictions of the best weather prophets, even aided by barometers and reports from outlying signal stations, are uncertain. But, at the same time, there is a great difference between the man who can make a tolerable forecast of what sort of weather may be looked for on an afternoon fixed for a picnic, and the man who has no data at all for an opinion, but thinks, as so many people do, that it is going to be fine at 3 P.M. because the sun is shining at 9 o'clock in the morning. In the same way, it is odd how very few people there are who notice the vegetation of the district in which they dwell. One is often surprised to find how few persons among those who are in a general way observant and intelligent have observed that particular trees and particular plants and flowers grow upon particular kinds of soil, or under particular physical conditions. If you were to ask, for instance, one of your ordinary intelligent friends who live in the country if he could tell what plants are characteristic of chalk soils, or what kind of soil it is that any particular tree, let us say a fir or a beech, prefers, you would be surprised to find how few there are who could give you an intelligent and correct answer to such a question. Yet observation of this kind does not require any special botanical knowledge. There are persons who do not possess that special botanical knowledge, but could give those answers, but they are comparatively few. This is the third advantage which I claim for the study of geography as a gateway to science, that it may be made an admirable training not only in observation but also in reflection upon the phenomena lying all round us in external nature, which we know from an observation that is within most people's reach.

Fourthly, the study of geography in this way adds immeasurably to the pleasure of travel. We all of us enjoy in increasing measure at the present time opportunities of travel by land and sea, and for one person who crossed the Atlantic from the continent of Europe to the continent of America fifty years ago, I suppose there are at least twenty or thirty who cross now, while for one person who crossed the channel to France fifty years ago there are a hundred now. How few people use adequately the opportunities for the observation of physical phenomena, or indeed for observation of any kind which travel gives, or who possess the amount of knowledge required to enable them to observe properly and to get the full enjoyment which travel is capable of yielding. There is no greater pleasure to be derived from travel than that of learning something about the country one is visiting. You cannot properly understand a country, unless you have a knowledge of the fundamental facts of its physical geography, and have formed the habit of observing them. Without this you cannot form a true

conception of a country as a whole. Sometimes I have fancied it would be worth while to try and provide at one of our Universities some systematic instruction in the kinds of knowledge and skill in observation which come chiefly into play in travel. There was a book written some thirty or forty years ago by a distinguished friend of yours and mine, Mr. Chairman, I mean Francis Galton, called *The Art of Travel in Wild Countries*, which describes a great number of devices which the traveller will find useful in dealing with savage men and overcoming difficulties of wild nature. There is also another and very useful book of a similar kind called *Hints to Travellers*, which has appeared since and gone through several editions. But perhaps there is still room for a book more comprehensive than either of these, and less scientific than the latter, more on the level of the unscientific mind, taking in some matters which do not belong to physical science at all. Such a book might suggest to travellers or tourists how to observe the relation of the rocks to the scenery, what the relation of the rocks is to the vegetation, what the relation of the climate to the vegetation, and how to estimate the productive capacity of a country, how to learn something about its races, about its antiquities, about its economic conditions, and about its languages or dialects. When one takes a long ocean voyage, one is surprised to find how small a number of persons there are on board who know anything of trade winds or monsoons or ocean currents, other than the now familiar yet often not very well understood Gulf Stream. Yet how much such a knowledge adds to the pleasure of travel. Such a book might be elementary enough to be fit for persons possessing no special mastery either of science or of history. It would not replace either of the books I have referred to, but it might be useful to a somewhat wider public.

I now come to the second of the three aspects of geographical science, that is to say, to geography regarded as the key to history. The conception of that relation has now become so familiar an idea that it is not necessary to go into it in any detail. Everybody has come to realise the important part which physical environment plays in the development of mankind—not only of mankind as a whole, but of every particular race of mankind, of every nation, and of every state. And you have books, like the new *Universal History* of Dr. Helmolt, which devote themselves to treating history from this point of view, and showing how it may be regarded as being the outcome of the physical environment in which man as a whole, and the different races and communities of man, have found themselves placed. This way of looking at history has only recently become common, and the fact is remarkable when one considers that the influence of nature upon man must have been present to the minds of reflective men from remote times. One finds isolated remarks on the subject even in the ancient philosophers and historians, so it is a little surprising that it is only quite recently, to the best of my recollection, that historians have begun to treat the physical phenomena of a country seriously and systematically as a very important element in the development of that country. Now, speaking from recollection, I think that Gibbon, for instance, makes few and scanty references to the physical

phenomena of the regions over which his splendid survey of the passage from the Old World to the New led him; so if one takes a still more brilliant ornament of the eighteenth century, Montesquieu, one of the most fertile and ingenious minds that ever approached historical inquiries, makes comparatively slight use of the relations of nature to man. You will, of course, in these and other great writers, find occasional remarks which show that the relation was not absent from their minds, but they do not seem to have grasped it as a whole, or presented it with anything like the completeness with which a modern philosopher or historian would think it necessary to explain the influence on man of his physical environment. One younger contemporary of Gibbon occurs to me who had ideas on the subject. I mean the traveller Volney. In his book about America, which he visited shortly after the revolutionary war, he has made several rather striking remarks which showed that ideas of this kind were beginning to make their way. No doubt there are many other thinkers in whose works you would find indications of this way of looking at history; but it has been reserved for our own time to realise the extreme importance which environment possesses as an historical factor. And yet, after all, there was Herodotus. Herodotus, more than twenty-three centuries ago, was equally an historian and a geographer, although he did not bring the two things into regular scientific connection, but any one can see that he was equally interested in both, and he was just as anxious to describe the physical conditions of the country as to give an account of the history and people. However, we are now all agreed that geography is the foundation of history, and that the historian must know geography. It is perhaps not equally necessary that the geographer should know history. At the same time, a geographer may gain a great deal by knowing something of history, and some branches of his subject will remain incomplete unless he possesses that knowledge. Without pursuing the subject in detail, it may serve to illustrate the proposition that geography is the key to history if I mention some branches of history upon which geography pours a direct and illuminating light. One of these, for instance, is ethnography. The whole study of the races of mankind, and their connections with one another, and their mingling and blending with one another, and their passage from one part of the Earth's surface to another, evidently depends upon a knowledge of geography, and in particular of physical geography, because it is these physical conditions that have influenced the movements and blendings. So linguistic history, which is almost a branch of ethnography, is another subject on which the geographer can throw light. Or take the case of military history, itself a branch of political history, and consider how much physical geography has to tell the student of wars and campaigns, about the importance of lines of communication, the significance of mountain ranges and rivers, the places available for fortification, whether by seas or rivers, or on hills. You will see at once that a knowledge of the physical geography of a country is essential to the man who studies military history in a scientific spirit. Then if you come to that large branch of history for which we have no satisfactory English name—what the Germans call Kulturgeschichte, the

history of the social and economical progress of man, the history of the kind of culture which expresses itself in social life and artistic life and the development of letters and learning and science—that branch, again, is of course intimately connected on many sides with the physical environments of the countries in which a civilisation has been developed. And you may find in such a book, for instance, as Mr. Payne's recently published *History of the New World called America*, how the whole history of the aboriginal American peoples, and especially of those who early attained to a certain measure of civilisation, can be treated most profitably in connection with the physical conditions under which they lived, and under which the latter outstripped their fellows. A particular branch of this subject illustrates very well what I mean, and that is the history of architecture. This history, which might seem to be comparatively far removed from physical geography, is intimately connected with it. One of the points in which it is connected is in the rocks which furnish building-stones, and in the different character impressed upon the buildings in any district by the materials which are at the builder's disposal. Another side is climate. Climate has had an influence on architecture in determining the shape and covering of buildings, and also in determining the nature of the carving and exterior ornaments that it was worth while to put upon the buildings, because in some climates decorations soon perish, while in others they remain fresh and clear during many centuries. And further, of course, a very interesting side of the history of architecture is the history of the relation of the architecture of one people or political community to the architecture of another, and the influence which the architecture of one community has exercised upon that of another. I remember, for instance, how often the late Mr. Freeman used to insist on the importance of what he called the Burgundian type of architecture. It is one of the types which, until he made it familiar to us, had almost passed out of our minds, and yet it is perfectly true that you do find in certain districts on both sides of the Alps interesting traces of a common type which become explicable when one remembers what the former political conditions of these countries were. And when one begins to consider the former political conditions, one is naturally led to ask what were the physical causes under which they arose. Notice, further, that there is an extremely interesting aspect under which geography ought always to be studied in relation to history, and that is the change in the relation of man to his environment in earlier and later times. This is a special point which I will do no more than indicate, but you will see in what an interesting way it might be worked out. While man is still in his primitive stage, not yet civilised, he is in entirely different relation to natural conditions from that which he bears when he has invented arts and sciences, and when he has become master of the forces of nature. In his primitive state, defence against wild creatures and ease in procuring food were his primary necessities, but in his more advanced stage it is the facility wherewith he can obtain a supply of those forces of nature which he can bend and use for his own purposes that becomes the most active agent in advancing his further progress.

There is also one aspect of the relations of geography and history which is of great importance, and that is the history of geographical discovery. We do not always, in our teaching of history, give quite enough importance to making the pupil realise the quantity of geographical knowledge which was possessed at different periods of the Earth's history, by the various peoples who inhabited it. Many a young man may go through the university course, having realised very imperfectly what was the amount of geographical knowledge that was possessed by the ancient world at different epochs, or the steps by which geographical discovery since the days of the Portuguese, in the middle of the 15th century, has been advanced. It adds much to the interest of study, and explains many of the phenomena of history, to make the pupil at every stage of his progress have a picture of the world as then known before his mind, and to realise where it was that darkness lay, and on what points light had from time to time fallen, during the long progress from the days of Homer to our own, in the discovery of the various continents and oceans of the world. For that purpose we want a greater number of historical maps in our atlases than we generally possess, and I am sure nothing could be more serviceable than to have these constantly displayed before the pupil on the walls of a college lecture-room. It may be that in the best historical schools this is now done, but it was not so twenty or thirty years ago.

Lastly, the third aspect in which geography comes into education, or rather the third of the aspects that I am asking you to consider, for there are doubtless other aspects, is that in which it is regarded as the basis of commerce. Commerce reduced to its simplest terms is an exchange of products, and both the maker of any article and the exporter of that article ought to know where each article can best be produced, whence the raw materials used in manufacture come, which are the places best adapted for manufacture, and where are the best markets. To use the words of Virgil, the merchant ought to know *quid quaeque ferat regio et quid quaeque recuset*, what each country bears and what each country refuses to bear. He ought to know what are the conditions under which the product can be obtained, what are the conditions of labour that determine the getting it and transporting it, what are the markets, whether near or distant, in which it may best be disposed of, what requirements affect its production, and what are the lines of communication and transport along which it can best (most swiftly and profitably) be carried, whether by sea or land.

This commercial side of geography has two aspects. It may be considered in regard to the direct and immediate utility which it has for the manufacturer or the exporting merchant, or it may be considered as tending to aid in the general expansion of his views and his comprehension of the financial and commercial conditions of the World. Of course it is true that a manufacturer or an exporter will primarily rely upon the direct reports which he receives from his agents abroad. Every considerable manufacturer or exporter will probably have an agent, or at any rate some adequate source of information, although no doubt our merchants have not yet done all they ought to do in providing themselves with such

means of information concerning the different markets of the world, so that they may know whence they can best obtain their materials, and whither best send their manufactured products. But while it is chiefly upon these direct reports by trained observers on the spot that the merchant must rely, he will comprehend the whole subject a great deal better if he has acquired a general mastery of the commercial geography of the World, if he knows the producing areas and the markets and the lines of transport as a whole. A great commercial man, whether he be a great manufacturer or a great exporter, can develop for himself certain lines of commercial action, can frame a large policy upon which to conduct his operations. In the same way as a general would determine where to distribute his forces, so he will consider where he can best get the materials he wants and to what markets he ought to send them. His wider knowledge of the World as a whole will enable him to take not only a more intelligent but a more practical and serviceable view of what ought in each particular case to be attempted. His policy will of course frequently need to be varied. It will never do for a man holding so important a position to rely upon what he has learnt years before, because the conditions are constantly changing. What is needed is that he should have a due conception of the magnitude and complexity of the subject, and of the proper methods that must be brought to their study. In this way geography may be said to become a branch of, or a sister science with, economic science.

I have felt for many years, and indeed have taken many occasions of urging, that modern commerce, whether it be regarded as an exchange of commodities, or be studied from the side of production, or the side of finance, has now become a subject which ought to receive full university recognition. It is a subject which is quite worthy of being treated in a philosophical and scientific way and of having a place in the curricula of our universities. That was recognised some little time ago at Liverpool. The University College there started some classes on a small scale, but still with the due appreciation of the principle I have been endeavouring to set forth. Those classes are giving young commercial men an education in what might be called commercial science. I believe the same thing is being done or going to be done at Birmingham and probably elsewhere. It is most satisfactory to know that geography in its relation to economics is receiving great attention at the London School of Economics, which has now become one of the schools of the new Teaching University of London. I learn from the Director of the school that these classes are well attended, and that recognition is being given by the University authorities to geography not only in connection with physical science, but also in connection with economics and history.

The aspects in which I have been endeavouring to regard the teaching of geography are perhaps rather fitter for a university or for advanced scholars than they are for a school. At the same time much may be done even in school for pupils between the ages of 14 and 16. There is all the difference in the world between being 'elementary' and being 'superficial.' I would not suggest that schools should deal with the subject if only a superficial treatment could be given to it, but I believe that

even elementary knowledge may be made profitable, provided that it is always given in close connection with facts which the pupil can be taught to observe and reflect on for himself, and not as a mere string of data to be carried in the memory. Let us, however, remember in all these discussions about commercial teaching, that neither it nor any other professional subject must be suffered to interfere with the giving of a generally stimulative liberal education to boys in school. Of course the more you can teach in school, so long as pupils thoroughly understand it, the better; but you cannot specialise to any great extent with boys who are going to leave school at the age of 15 or 16. It is necessary to lift up one's voice against that. But when you deal with young men who are going to remain at a higher secondary school till they are 17 or 18, or are studying at the university, you are dealing with a class from whom will be drawn the upper officers and what may be called the general staff of the army of industry, and you cannot give too much pains and thought to enlarging their views of professional branches of instruction, and giving them an intelligent conception of the phenomena with which they will be concerned in their business life. A large part of those deficiencies in the scientific commercial aptitudes of business men which we hear commented on, springs from the want of regard that has been had to the needs of those who are going to step into the position of heads of leading firms. You can hardly overrate the importance in the conduct of any large business, be it a manufacturing or be it a mercantile house, of the possession of a wide and intelligent knowledge of the financial and economic phenomena of the modern world. If you have at the head of the great businesses, of which there are so many in this country, men who have been thoroughly trained to observe these things and to look at them in a scientific way, you will have done a great deal towards helping us to maintain our place among the commercial nations of the world.

I had thought over a number of hints that might be given about methods useful in geographical teaching, but I have come to the conclusion, especially since reading your excellent organ, the *Geographical Teacher*, that it is not likely I should be able to say anything that has not already occurred to the minds of some of you. I am glad to see there is a movement for the education of our examiners. They are by no means abreast of the day in the kind of questions they often put, and it would be a great stimulus to the teachers of geography if they were to find that examinations turned more frequently upon the intelligence of the pupil, and upon his mastery of the relations of facts to one another, rather than upon the answering of questions for which he must trust to his memory alone. The best teachers have now realised the importance of endeavouring to familiarise pupils with natural objects, and I hope you will not omit any opportunity of pressing even cycling excursions into your service and of taking boys, as they do in Germany, upon tours by which they can learn more of the physical aspects of the country than they can learn from books. Perhaps you might do more than is generally done to encourage the reading of books of travel. Noting the absorbing devotion which boys now show to journals which contain

reports of cricket and football matches, one is disposed to fear that the private reading of boys, which largely used to consist in reading books of history and books of travel, is perhaps not quite so general as it was some thirty or forty years ago. I am quite sure that nothing helps a boy more to take an interest in geography than if he forms a taste for books of travel, and if his teacher encourages him to do so and talks to him about what he has read. I am glad to think your Association has begun to receive so much support and now sees such a useful field opening before it. May I, in conclusion, express to the meeting, and in particular to you, Mr. Freshfield, who have done so much for geographical science as a traveller, and have so frequently and forcibly dwelt upon the value of geography in education, my hearty sympathy with your efforts, and my hopes that they may be crowned with success?

GEOGRAPHY IN THE UNIVERSITY.

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I. The University in Relation to Modern Life.

Universities, in addition to their other functions, have always aimed at training the men who are to shape the destinies of their country and of their time. There has never been a time in the world's history when trained leaders were more needed. The modern world has become, at least in its material details, much larger and more complex than the world of the middle ages, when soldier and priest, doctor and lawyer, were the only professional men. Never were so many careers open to young men as at the present day. This fact is reacting on our universities, which are gradually enlarging their scope and their staff to meet modern requirements. It is not, as some suppose, a deplorable concession to commercial materialism that the Universities of Birmingham, London, and other cities should form faculties of engineering, economics, or commerce, or that the ancient University of Oxford should possess a School of Geography. A generation hence it will be considered as serious and honourable a duty to train administrators, financiers, and merchants as it is to-day to prepare clergymen, lawyers, and doctors for their work in life. This is not to belittle the universities into schools for teaching bread-and-butter subjects, but rather to prevent the otherwise inevitable divorce between the man of action and the man of ideas. The task of the universities is to fit young men to play their part worthily in the fierce struggle for distinguished existence in a world-wide arena. It will be a crime as well as a disaster if the men who are to shape the destinies of the next half century are out of touch with the wider culture which a university can and should supply, and

through our universities losing touch with the widening interests of individual and national life.

The importance of this can hardly be exaggerated. The prizes of success in the life of practical affairs are extraordinarily great in comparison with those offered by what are still commonly distinguished as *the* professions, to which may now be added the modern callings of the schoolmaster and the literary man. The capable young man, especially of the British and American type, is more and more attracted to the former at the expense of the latter, and is reluctant to spend three or four of the most important years of his life in work which has no tangible relation with his future life. In the immediate future the quality of the raw material coming for university training will tend to fall off, giving more and more semblance of truth to the assertion that graduation in a university is not graduation in a school of life. Lamentable as this would be from the point of view of the university, it would be infinitely more lamentable from the point of view of the individual and of the nation.

This is not the place to discuss this problem in all its bearings, but there is one aspect out of many in which we as geographers are specially interested, and to which we may profitably turn our attention.

II. The Value of Geography as a University Subject.

From the outset of its career this Society has striven to promote the development of geography as a science, and to further the growth of a rational tradition of its application to education. There can be no question in the minds of any members as to its value in education. All agree that few subjects are capable of being used as effectively in training the powers of observation, description, comparison, and classification, and of developing the imagination and widening the sympathies of the pupils. Here is the great World of ours with its contrasts of mighty ocean and great continent-islands, with its vast traversable plains and its lofty barrier mountains, with its arid, uninhabited deserts and its rich alluvial lands with their teeming millions. To-day this world, which was formerly broken up into a number of independent groups of men, isolated by bounding sea, desert, or mountain, is becoming one vast community whose distant elements are coming into closer and closer contact as means of communication improve.

The study of this world is (1) highly educative, (2) of the greatest practical value, and (3) is peculiarly essential in modern education.

(1) Geography is one of, if not the most, educative of subjects. This involves the question, What is geography? It is not summarised in Bradshaw and Whitaker, as was suggested in a recent report. Neither does it consist of mapmaking. Nor is it a hotch-potch of the elements of other divisions of science. It is an independent subdivision of science which deals with problems of distribution—more specifically with the subdivisions of the Earth's surface. It may be contrasted with those branches of science which are concerned with one class of phenomena, *e.g.* the non-vital of the physicist or the vital of the

biologist, or the purely mental of the psychologist, or with one class of forms, *e.g.* the rocks of the geologist, the plants of the botanist, the human beings of the anthropologist. Each of these has a distributional aspect which its students must regard. It is just as true to say that they are all geographers because they must take geography into account, as to say that the geographer is a physicist, geologist, biologist, etc., because he has to take the results of these divisions of science into account. They are inter-related. The geologist, anthropologist, and many other men of science have to make use of the work of geographers as the geographer has to utilise their work. Each supplies the geographer with material which he combines, and so returns it in a more elaborated and useful form. The geographer, taking the facts of geological, climatological, biological, and other distributions from the works of those who have specialised in these subjects, compares them, and shows their interrelation in the different regions of the globe. The geographer co-ordinates phenomena in space, as the historian, in the widest sense of the word, co-ordinates them in time. He is essentially synthetic, and if he is analytic, it is only to be more synthetic. This synthetic discipline of geography is of the greatest educational value, and meets the wants of those who cry out, and rightly cry out, against the excessive subdivisions of knowledge. It unifies the separate sciences, it trains the senses in concrete observation and in the discussion and interpretation of physical, economic, and other statistical data applied to distributions, and above all it stimulates the imagination and the sympathies. It is an essential department of the modern humanities.

(2) Although few dispute the practical value of geography, as a rule it is greatly under-estimated. Geography is not to be ranked with shorthand, or commercial practice, or even a modern language studied for its commercial utility. It is not merely a tool of the business man and the politician, of the military man and the sailor. It gives an added power to the man of affairs, if he is taught to see, think, and act geographically. It suggests possibilities of as well as limits to expansion. No sane man expects to gather figs from thistles, but many costly attempts have been made to do equally impossible things through ignorance of geography. On the other hand, a comparison of distribution, such as the geographer attempts, often yields valuable practical results: for instance, the correlation of a certain rainfall with the sheep-rearing capabilities of a land: in South Australia with 8 to 10 inches of rain per annum eight or nine sheep can find food in a square mile; with 20 inches in New South Wales, 640 can.[1] This in turn affects the density of population, the possibility of railway construction proving profitable, and many other distributional problems of practical significance.

Geographers are only at the beginning of their task of interpreting environment. It is obvious that as they come to understand better the essential elements of each region and arrive at satisfactory classifications of the varied regions which make up the World, they will more and more supply a fund of condensed experience which can be drawn upon

[1] *Scottish Geographical Magazine.*

by students of geography at will. As an example, we may choose the Mediterranean type of climate, of warm, dry summers and cool winters, where most rain falls in the winter half-year. With it we associate certain cultivated plants and certain economic conditions. A geographer who has studied these in the Old World Mediterranean area knows the salient facts about the climate and economic products of six other parts of the globe—Southern California, the southern valley of Chile, the south-west corner of Africa and Western Australia, and the south of South Australia and Victoria. He has only to learn how local variations in configuration, soil, density and capacity of population, the development of means of transport, and other factors, cause secondary differences in these primarily analogous areas.

3. Such facts are of incalculable importance to the leaders in the modern World. The uttermost ends of the earth have nearly been compassed, and the lands divided among the nations. The pioneer explorer and the pioneer conqueror are giving place to the scientific student of a limited area and to the administrator. Sir Harry Johnston has in his day played all these parts, but his successor is essentially of the latter type. The soldier has turned administrator in Nigeria and many other Protectorates. The adventurer becomes merchant. The manufacturer is not content with his mills in Lancashire, but starts factories in India or China. The financier buys claims in Klondike, corners the wax product of South-West China, and controls the traffic of half a continent. Even the old learned professions are affected. The new missionary spirit takes cognoscence of local conditions; the doctor sends his patients to Bohemian baths or dry karroos; the jurist has more and more to deal with international law; the journalist records and comments on the affairs of the universe with supreme composure and confidence; the schoolmaster has all these men to mould in their early years.

For the world's sake, as well as for our country's and our own, we must have in this twentieth century as full and intelligent a knowledge of the World as possible. Ignorance of geography produces frequent friction and occasional wars, stupidity in commercial enterprise, hasty and reckless counsels in our journals, and loss of life, or the worse loss of prestige in the soldier. Be it politics, finance or commerce, missionary zeal or the mere pursuit of health or pleasure, our end will be more effectually attained if we have studied environments.

III. The Teaching of Geography in the University.

If geography is to be a university subject, how is its study and teaching to be organised in the university? In Oxford, Cambridge, and London special departments have been formed; in Birmingham and the University Colleges it has been handed over to the geologists, historians, or economists. The latter is a temporary expedient, admittedly due to lack of money. In continental universities geography is an independent department with a staff of its own. In Paris there are three departments of geography—physical, general, and colonial—in the Sorbonne alone, one at the Collége de France, one at the Ecole des

Hautes Etudes, one at the Ecole des Sciences Politiques, one in the great Ecole Normale, one in the Ecole des Hautes Etudes Commerciales, one at the Staff College at St. Cyr, and it is taught by special teachers in many other higher educational institutions. This list gives some idea of the numerous interests which a fully equipped geographical department must be prepared to meet.

In our country the geographer in the university is hampered at every turn by the insufficient teaching of geography in our schools, which again by a vicious circle is due to its neglect in the university, so that on the one hand teachers have had no training in geography, and on the other depreciate the subject as not a "paying" one. An immediate result of this is that the first year's course in geography must be elementary—not superficial, but elementary—general rather than special, suggestive rather than informational, giving a geographical bias to the mind of the student. After the first year specialisation is necessary, and will depend on the other interests of the students, unless these are primarily geographical, when a fuller all-round training is essential.

The student seeking at the university a general culture will follow the general course on geography. We may divide those who require special courses in geography into two groups—the theoretical and practical students, those who mean to devote their life to study, and those who study to fit themselves for a life of action. Of the former group, those specialising in climatology, oceanology, geology, biology, anthropology, history, and economics will normally choose geography as one of the minor subjects for their honours course. The future men of action—business men, teachers, civil servants, politicians, journalists, soldiers, etc.—will also require special courses. Those more advanced studies may be arranged in four groups—(1) physical geography; (2) economic geography; (3) political geography in the widest sense, including historical and military geography; (4) educational geography.

A large staff is necessary to carry out the ideal programme. At present we must consider what can be managed by a staff of one or two. The first provision to be made is for a general course of lectures on the principles of geography and on the great regions into which the World can be divided, supplemented by a practical class meeting both in the field and in the laboratory, to study the different notations of the geographer, more particularly the various methods of mapping topographical and other observational and statistic information, as well as the interpretation of maps, charts, and diagrams. This practical class would not attempt to make trained explorers or cartographers, but by a series of simple exercises would give the student an idea of the more important principles which guide these specialists in their work, and permit him to use their results intelligently. This should suffice for the pass degree.

The advanced work must be planned so that a student choosing geography as one of his honours subjects may graduate in two years after completing the general course. As an honours subject it should be divided into at least three divisions—(1) physical; (2) political;

(3) economic—at least one of which, along with a minute knowledge of the geography of selected regions, should be studied. The courses for honours students should be so planned that at least once in two years a sessional course would be given which would meet the needs of honours students in other subjects who wished to work at only one section of geography. The British Isles should be one of the regions selected for special study at least every other year, and might be alternated with a course on Greater Britain. This would leave two sessions for the treatment of other countries. For geographers and other research students post-graduate work would be specially planned to suit individual needs.

In the immediate future, those preparing to be teachers and business men are likely to form a majority of the students of the geographical department of most universities, and the advanced teaching should first be made to suit their requirements. With only one lecturer or professor of geography in a university this would be best attained by laying most stress in all advanced lectures on economic problems, and differentiating between the economic and educational students in their practical and tutorial work, the former being more statistical, the latter either more physical or more historical according to the other work of the student. This plan has the advantage of specially training the teacher in economic geography, the aspect of it with which he has to deal in evening colleges and schools, and even in the upper classes of secondary schools, where, however, such specialisation should be introduced with the greatest caution, and only in the case of pupils over fifteen or sixteen. It would, however, induce him to give in his lesson to younger pupils many economic illustrations, which is as desirable as too early specialisation on commercial geography is the reverse.

Gradually as the universities recognised the importance and necessity for their undertaking to prepare the administrator, politician, and journalist, political geography, in its actual and historical aspects, would be emphasised. With a staff of two this might be undertaken from the beginning, one member specialising in human geography in the widest sense, leaving the other to develop the equally important physical geography, without which political geography becomes vague and unprofitable.

The geographical department must be in close touch with other departments of the university, and ought to be recognised as part both of the faculty of arts, and of the faculty of science, as well as of the faculty of economics or commerce where such a faculty exists; for geography is related to both the humanities and the physical and natural sciences. It should be open to both arts and science students to select it as a pass subject, and those who take it as an honours subject should be permitted to select the other subjects either from the other arts subjects, or from the other science subjects. It is noteworthy that in Germany, where as a rule the teacher of geography must have a special training in the subject before he is allowed to teach it, geography is the one subject in the final examination for the teacher's diploma which may be chosen by both a student of arts and of science, and he who selects

geography as a major subject is permitted to take the minor subjects either from those in the arts, or from those in the science group of subjects.

IV. The Equipment of the Geographical Department.

It has been said that a good teacher needs no apparatus, or that he should improvise it. No doubt much can be done, and should be done, on a blackboard with a piece of chalk. The skilled labourer, however, is worthy of the best tools, and it is part of the training of a geographer to know his tools, from a compass to a volume of statistics, and to know how to handle them. All teachers of science, from physicists to anthropologists, recognise the value of proper appliances for practical study and for the adequate illustration of lectures. The geographer needs his scientific instruments as much as the physicist, his museum of types as much as the zoologist, and a well-lighted laboratory as much as an anatomist. Lectures, demonstrations, work in field, laboratory, and library are all essentials and must be provided.

The cost of providing buildings, fittings, apparatus, books, globes, maps, views, and other essentials of a geographical department, and the endowment necessary to keep these up, to pay an adequate staff, and supply two or three scholarships, would undoubtedly be great if carried out on the same scale as modern physical, chemical, or biological departments. Such a geographical department would be not merely a great teaching centre and an important place of research for the solution of theoretical and practical problems, but would be an institution collecting information about the diverse countries of the world, classifying it topographically, exhibiting the results in diagrammatic or map form for those who chose to visit the university geographical institute, summarising it by its publications for the public, and through its staff supplying information for merchants, administrators, explorers, soldiers, and others—even the holiday-maker—who chose to consult them.[1]

In the present paper, however, we have to consider not the ideally best, but the immediately practicable. In a number of cases it is not necessary to begin *ab initio*, for in centres like Edinburgh, Manchester, and London, part of the work is already done by the geographical societies. In organising any geographical department, this should be taken into account so as to avoid any overlapping the work already done by the geographical society, the chamber of commerce, and other public bodies with geographical interests and activities. There should also be the most cordial co-operation among these institutions, so as to prevent unnecessary reduplication of material. Even if a geographical department could draw on the resources of such societies and public bodies, it would still need a large equipment of apparatus and of books, maps, and views

[1] In a paper by the writer on "The Position of Economic Geography in Education" in the *Journal of the Manchester Geographical Society* for 1899, some additional observations will be found on this point, and also in a paper which will shortly appear in the American *Journal of Geography*, dealing with the ideal geographical institute.

selected for teaching purposes, leaving to the geographical societies and other bodies the collection of reference material.

Coming to the approximate minimum equipment required for teaching purposes, there must be suitable rooms both for lectures and for practical work.

In the lecture-room, in addition to black-boards and diagram-screens, there must be a lantern, and if possible a double-headed lantern which would throw two pictures on different screens at the same time, and thus permit a comparison between two maps or between a map and a view. A collection of the best wall-maps, and of slides of maps, diagrams, and views, is indispensable.

The laboratory should be furnished with large tables, with desks and cases for storing apparatus, maps and books. Among the instruments should be an ordinary and prismatic compass, plane-table, alidade, clinometer, sextant, level, theodolite, barometer, thermometers (including boiling-point and deep-sea forms), planimeter, measuring and drawing instruments of all kinds, and a good camera. Globes should be procured which illustrate not merely political or orographical distributions, but also geological, climatic, biological, and economic ones. A collection of models is highly desirable, especially such as illustrate typical regions (*e.g.* Heim's models of parts of the Alps) or typical land forms (*e.g.* the Harvard models).

Too much care cannot be bestowed upon the selection of maps. When Professor Reclus's disc maps are completed they will be essential as the only ones which depict the regions of the world on the true curvature in a uniform scale and in uniform design. The larger-scale maps and charts should be so selected as to illustrate regions of special physical or historical interest, and at the same time different styles of cartographic work. The best available general maps illustrating orographical, geological, climatic, biological, anthropological, economic, and historical distributions should be procured. The best text-books in English, French, and German should be on the library shelves, a selection of the most important geographical monographs and gazetteers, atlases and classical books of travel, as well as of statistical annuals and reports, and some of the more important geographical periodicals.

V.

The geographer, then, is he who seeks out the laws relating to different orders of phenomena associated in space, who inspires youth with true conceptions of the ordered greatness of the World whereon he lives, who shows forth the dignity of Man in his achievements as a co-operator with Nature, and at the same time the humility of Man controlled by his environment.

A geographer is at once a patriot and an internationalist, keenly alive to the necessity of stimulating the full development of local activity and resources, yet world-wide in his outlook and sympathies. The one is essential to the other, for each part of the World is now so closely linked to every other part, that healthy progress in one is favourable

for all. The geographer is a student of the world of peace as well as of the theatre of war—the exponent of the environment to be dealt with in any venture, commercial or military, political or missionary. He must have time to study and to travel, and in return, the fruits of his observations and his thoughts should be given to his pupils and to the world. It seems to the writer that one of the most important duties of geographer is to show forth sympathetically the conditions of other countries to the younger generation in the university, and on occasion to the public, and thus help to remove prejudice and foster good feeling, which is so essential for the rapid harmonious development of this complex world in the twentieth century.

A BOTANICAL SURVEY OF SCOTLAND.

By William G. Smith, B.Sc., Ph.D., Yorkshire College, Leeds.

(*A Paper read before Section E at the British Association, Glasgow*, 1901.)

An observer, after some experience of travel in Britain and abroad, acquires the impression that landscapes differ, the hill-region from the plain, the northern from the southern, a cold region from a warm or temperate. Differences in the vegetation assist largely in fixing this impression; thus a region of cornfields and woodlands contrasts strongly with the grassy or heathery moorland. Geological features give character to hill and dale, while the nature of the underlying rocks or other deposits, and the presence or absence of stratification, dip, and jointing have an effect on the surface vegetation. Geographical and climatic features, altitude and latitude, degree of exposure to sun, cold, wind, and rain, together play an important part in determining the distribution of plants, and in modifying the soil for plant-life. The influence of man in a country like Britain is also no minor factor in making a landscape.

In the records of travellers, description is assisted by reference to dominant features of vegetation; thus Humboldt (1806) distinguishes nineteen plant-forms as characteristic,—palm, cactus, bamboo, grass, etc. In Britain to mention cultivated fields, pine woods, or heather moors is to recall scenes once visited. The use of maps to demonstrate the features of a country is evident. The orographical map with heights and depths coloured according to a scheme of tints is a great advance on a black and white map, however well supplied with contour-lines and other information. Geological maps with the various formations indicated by distinctive colours are now prepared for many countries. Facts regarding rainfall and other climatic features are also conveyed by maps rather than by statistics. But the distribution of plants is as yet recorded on maps only in the most superficial way. The existing vegetation charts, found in recent atlases of physical geography or in works devoted to plant-geography, are based on the assumption that the relations between

vegetation and the factors regulating the distribution of plants, are so broad and general that they can only be represented on maps which include some large portion of the earth's surface drawn to a small scale. In the first decade of the nineteenth century, A. Pyr. de Candolle planned a map to show the main features of plant-distribution in France, but it remained in the initial stages because reliable maps of the country did not exist, and information which might be of use to an invader was suppressed. The actual publication of vegetation maps was an event of the last decade of that century whose beginning saw the suggestion. It is not our intention to trace in detail the development of plant-geography which led to the present position, but a few stepping-stones will give a clearer understanding.

In Britain, the principal method of recording the distribution of plants has hitherto been that laid down by H. C. Watson (5, 6, 7).[1] According to Watson's scheme, Britain is divided into eighteen provinces, thirty-eight sub-provinces, and one hundred and twelve counties and vice-counties, the limits of which are partly natural, partly political. Since vegetation changes according to altitude, a lower or agrarian region is distinguished from a higher or Arctic region, and each of the two regions is sub-divided into three zones designated infer, mid, and super respectively. The zones are characterised by the occurrence of certain plants; for example, the super-agrarian zone extends upwards to the limits of cultivation or to the altitude where the Bracken Fern (*Pteris aquilina*) ceases, above this the infer-arctic zone begins. The northern limits of the agrarian zones are defined by certain lines of latitude, thus the infer-agrarian plants occur south of a line across England from the Dee to the Humber, while the mid-agrarian extends northwards to a line from Clyde to Tay. The Arctic zones are only represented where vegetation occurs above 1500 feet. In the *Cybele Britannica* and its *Compendium*, each species of plant is examined as to its distribution in counties and zones in Britain, its occurrence beyond Britain, and other details. Watson had distinct ideas of the use of maps in his work, but we only know of those which represent the vice-counties and those where each species is shown on separate maps. The method of Watson has been followed by other workers in topographical botany; the map which accompanies the Handbook of Natural History issued at the British Association Meeting at Glasgow is an example.

The subject now under consideration, the botanical survey of Scotland projected by the late Robert Smith, is based on a different conception of vegetation, though the earlier method has aided in its development. The impetus towards the present method has been given chiefly by an increased interest in the study of plants in relation to their environment, or, as it is called, œcological botany. Under this influence field botany is no longer merely the seeking, collecting, and preservation of species in herbaria and their names in a flora; it is still a primary essential to recognise accurately common species at least, but investigation of structure

[1] Numbers after authors' names refer to papers in the list given at the end of this paper.

and interpretation of these as adaptations to conditions of life cannot be ignored. This distinction may be better expressed in R. Smith's own words (2): "The floristic method of study, on the one hand, is more directly concerned with the historical development of the flora. It attempts to answer the questions: How have these species originated? or whence have they come? It studies phylogeny and migration; and the botanical characters to which it directs attention are those on which we chiefly rely for indications of racial affinity, namely, those of the floral organs. In considering the vegetation, on the other hand, the essential characters of the species are those indicating adaptation to the environment, and are to be found mainly in the vegetative organs. Hence groups of similar adaptational form need by no means coincide with natural families or groups of species." The text-book by Warming (4) explains the application of œcological botany to plant-geography; it is a crystallisation of his own numerous observations and of the work of earlier observers; it may be taken as the standard work on this particular aspect of botany. Œcological plant-geography considers the plant-species less for itself and more as a unit in a community or association of plants. The plant-association may be defined as a community or society of plants living together and adapted to certain conditions of environment. In each association there are—(1) one or more dominant social forms, (2) secondary or sub-dominant forms struggling for dominance, (3) dependent species. For example, a natural wood consisting entirely of oak-trees has one dominant form—the oak—whose presence is determined by the prevalent climatic, soil, and other conditions, while its size and gregarious nature give it dominance; in this wood there may be other trees or shrubs (*e.g.* birch, mountain-ash, or hazel), more or less isolated, but which, given the opportunity by removal of the oak, will become dominant forms; the motley carpet of the oak wood is made up of many species dependent on the larger forms for shelter and shade, or living as epiphytes, parasites, and humus-saprophytes, and including not only flowering plants, but ferns, mosses, lichens, and fungi. The association is thus a mixed community with complex relationships, its members struggling for existence and dominance, but it is a coherent whole, and may be studied as a unit. The association may be considered broadly, or it may be limited to a few species; the recent tendency is to make the term comprehensive and wide. The vegetation of a country or other area may thus be regarded as composed of *either* so many species of plant, *or* so many associations. The species as a unit is something which is fairly definite, and lends itself to an estimation of so many hundreds per square mile. The plant-association has the disadvantage that it is a more arbitrary unit—at least in our present state of knowledge; it has the distinct advantage that the bewildering number of species of an area are gathered into a few groups, which may be recorded on maps and read with moderate ease by one who is no specialist.

Progress in the making of maps has prepared the way in no small degree for a botanical survey. The ordnance survey maps are sufficiently detailed to enable the geographer-botanist to ascertain his

position and the limits of an association without resorting to the surveyor's instruments. Recent advances of cartography in other directions, including the colouring of maps, render it possible to reproduce a working field-map with a moderate number of distinctive colours in a form convenient for publication. In the case of my brother's survey of Scotland, the scientific spirit and personal interest of Mr. J. G. Bartholomew was no small factor in the production of the maps.

A brief biography will explain the earlier development of the Scottish survey. The late Robert Smith had acquired at an early age a good knowledge of the flora of the Scottish east coast and the Grampians, and excursions to Ireland and Norway furnished new material and wider views on distribution. After the days of academic student-life and a short busy period as teacher, came the opportunity of a winter (1896-97) at the University of Montpellier with Professor Ch. Flahault, who is carrying out De Candolle's ideal of a botanical survey of France. During numerous excursions and in the intervening study in laboratory and herbarium, an enthusiastic master inspired a willing pupil and sent him home prepared to begin the work in Scotland. The earlier attempts were made in 1897 on the Pentlands near Edinburgh, and together we traversed these many times till the basis of the present method was developed.

The botanical survey of France as carried on by Professor Flahault (1) is based on the distribution of trees. From a geographical point of view, forests of a particular tree indicate certain conditions of climate and soil; from a botanical aspect, the presence of certain associated subordinate species; and from an economic point of view, regions suitable for the growth of certain cultivated plants. Flahault has selected characteristic trees, whose areas of distribution are ascertained by personal observation and recorded by colours on maps. In introducing the botanical survey to the Royal Scottish Geographical Society (3), R. Smith thus explains why this method was not quite applicable in Scotland: "To base the survey of the vegetation of Scotland on the distribution of the chief trees, as Professor Flahault has done for France, would give a very inadequate, if not erroneous, impression of the plant-covering of the country. Disforesting has proceeded so far in Britain that little primitive forest remains, and artificial planting has only begun the reconstruction of the former woodlands. The general plant carpet is formed by a type of vegetation lower than the arboreal, such as the cultivated plants, the grasses, the heaths, etc.; the woods occur only here and there. The main divisions of the present map, which seeks to show the outstanding features of existing plant life, have accordingly been determined by this lower vegetation, whilst the trees have only been indicated over areas which they actually inhabit." The information collected is, however, suitable for a comparison of the Scottish with the French survey.

In selecting the associations to be recorded, it is necessary that they be representative and numerous enough to include the whole vegetation of the area, leaving no blanks. At the same time it has to be kept in view that, on maps of one-inch or half-inch scale, a number of tints would

bewilder and only obscure the chief features of the vegetation. After preliminary trials, it was decided to represent the vegetation of the great natural areas as follows:—

I. *Littoral or Maritime.*—This area includes that belt of uncultivated land which fringes our coasts, as well as the submerged vegetation. Owing to the narrowness of this zone on the one-inch maps, it is coloured uniformly, although five associations were recognised by R. Smith, namely, submerged vegetation, salt-marshes, seaside rocks, sandy shores and dunes, and seaside "links" or fixed dunes. The area could only be adequately recorded on the six-inch-to-a-mile maps.

II. *Temperate.*—The area of vegetation agreeing with that of temperate Europe includes all land up to the limits of cultivation, an altitude on the average of 1000 feet (304 metres), but rising in places to 1250 feet. The area thus agrees nearly with H. C. Watson's "Agrarian region." In a country with a less artificial and more abundant tree vegetation than Britain, this area would be subdivided according to the distribution of characteristic trees, but, as already explained, that is unworkable here. The existing woods are generally a medley of introduced European and North American trees planted for effect rather than for any economic value. Two distinct types of woods of deciduous trees are however recognisable: Those in which Beech and Oak are together dominant, and those in which Oak alone dominates. These are indicated on the maps by two shades of green. The Oak wood is the more natural and better defined type; it occurs towards the upper limits of the agrarian region, generally in valleys along the streams, and as one passes downwards it gradually merges into the lowland type of Beech wood. The Beech rarely occurs as a pure association, it is indicative of the artificial plantation. The land under farm-cultivation presents several distinct types, of which two are represented by shades of yellow, viz., a lower zone where Wheat can be included in the farm-rotation, and an upper zone where Wheat cannot be grown. The influence of man is particularly evident in this agrarian area, and adds to the difficulty of recording. The maker of plantations has too often in view the embellishment of some domain, or the providing of coverts; the farmer follows the markets, and at present his land serves his purposes better under grass than in growing wheat. These economic factors mean much in the preparation of a botanical survey: they multiply time and labour, and the results are unsatisfactory. Yet it must be obvious to any botanist that the flora of the woods, hedges, and stream sides of the lowland Wheat area is distinct from that of corresponding places near the upper limits of cultivation; the difficulty is in fixing a line of boundary. Patches of moor may occur in the agrarian area; these are indicated in the same way as the moors in the sub-alpine. The colours used in representing the vegetation of the agrarian are indicative of wide associations, which in a map on a larger scale would be subdivided into communities of closer associates. In the Scottish survey this is suggested, and in a forthcoming survey of Yorkshire we hope to give it fuller consideration.

III. *Sub-alpine, extending from about* 1000 *feet to* 2000 *feet.*—The

moorlands of the parts of Scotland already visited fall into two great groups, the grassy moor and the heather moor; on the maps these are clearly shown by the use of a shade of green for the grass, and a brown for the heaths. The distribution of these two types, their associate plants, and their relation to environment, has received a full discussion in the papers already published, whilst valuable material for further work has been left in manuscript. A third type of moor also occurs, the peat-bog with either Heather (*Calluna*) or Cotton Grass (*Eriophorum*) dominant; on R. Smith's unpublished field-maps this becomes an important feature of the vegetation, and in surveying the Yorkshire moorlands it occurred over great stretches of country. The woods of the sub-alpine area consist chiefly of Scots Pine, Larch, and other coniferæ; two shades of blue indicate these, one being used where Scots Pine dominates with other coniferæ interplanted, the other for plantations of Larch, a conspicuous feature of the Scottish moorland woods. The upper limits of tree vegetation (about 2000 feet) are indicated by thickets of Birch with associates; a special colour is used to show these.

IV. *Alpine.*—Above an altitude of 2000 feet trees are rare, many species of plants disappear, and the vegetation becomes Alpine or Arctic in character. The Bilberry (*Vaccinium myrtillus*), a plant common enough at lower elevations as a sub-dominant form in the Heather area, becomes here a conspicuous dominant species covering extensive areas. The Heather and Grass types may also occur in the Alpine. The bare vegetation of many summits, consisting of little more than Mosses and Lichens, has a distinctive colour allotted; it corresponds to a large area of this character on the mountain-masses of Europe. Alpine crags with their interesting flora are also shown. Many of the richer stations of the Grampian and Breadalbane Alpine flora are thus recorded on the North Perthshire sheet.

The method of survey is to traverse the selected area till its prominent associations are recognised. The extent of country observed in a single excursion is variable and depends on whether the vegetation is uniform and easily accessible, or the contrary. It may be necessary to traverse a difficult area at distances of a few hundred yards, but in parts where the vegetation seen from a distance is found to be uniform the routes may be farther apart. Opportunities of checking previous observations occur when a place already visited is seen from another vantage, or when two routes cross, as they frequently do. In preparing the maps, the limits of prominent associations are ascertained and recorded on the field-map on the spot. A less apparent but more important work is to collect information regarding associations. When an association is recognised, the plants found there are recorded in a field notebook with the order of their occurrence as dominant, secondary, or dependent species, also their state of flowering. Other observations are made regarding subjacent rocks or deposits, conditions of drainage, the altitude, exposure, and environment generally. The records thus obtained are important not only as information about the vegetation and its local conditions, but also as standards for comparison. One type of

vegetation has to be compared with another quite distinct in character; or, it frequently happens that an association as developed in one place has to be compared with another somewhat similar but in a different locality. It is only by careful notes that one overcomes the difficulty of carrying on the survey during a series of excursions extending through two or three years, as was the case in the maps already published. The field-notes are also invaluable when one observer wishes to compare results with another. The maps used for outdoor work are generally the "one-inch" sheets of the Ordnance Survey, although in some cases the "six-inch to mile" sheets are preferable. The published maps are on the scale of one-inch to two miles, and this is a convenient size for publication with the small number of types of vegetation used. The number of types on the published maps does not, however, represent all those recognised in field-work, but they are taken as sufficient to effect a primary analysis of the vegetation.

A botanical survey of Britain carried out as suggested provides material not only for the botanist but for other scientific workers. The relation of vegetation to altitude is rendered evident in a way which admits of rapid comparison. The influence of climate may be traced from the maps by the meteorologist or geographer who has some knowledge of common plants. A distinction between the vegetation of the eastern side of Britain and the western is already evident, especially when one refers to my brother's unfinished field-maps of parts of western Scotland and to the Yorkshire maps. The method renders the maps of use to the geologist, and a relationship between the geological—especially soil maps—and the vegetation maps has already been shown in a way more convincing than hitherto. As the study of associations proceeds, it becomes more evident how many plants of our flora are bound up into definite communities, although all do not thus fall into distinct groups. Detailed studies of the morphology and anatomy of selected species are suggested as a profitable field for observations likely to throw more light on the relationships of plants to their environment. From an economic point of view the maps are useful guides. They show the dominant woods of an area and indicate what trees are likely to be profitably grown there. The distinction of grass moor from heather is a guide to its value as grazing or shooting grounds respectively, and an approximation of the area available for each purpose may be attained. The division of the agrarian region into Wheat and "No Wheat" has a value for the farmer, but a more detailed survey of cultivated lands with a record of the underlying soils would give better results.

The present survey was never intended to be final; it is a stepping-stone from our present maps of vegetation to detailed surveys of small areas thoroughly investigated in all respects. In such detailed surveys the associations selected would be small, and would include all the species of the British flora, and some light might be thrown on the question of varieties as produced by environment; the existing topographical floras would here come into service and their present value be further enhanced. On the other hand, the present survey in conjunction with similar investigations in other countries furnishes more accurate

records than exist for the preparation of vegetation maps of the earth generally; it is only by some method such as this that we can eliminate many of the rough approximations and errors which are evident on existing maps of plant distribution.

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THE MAKING OF AUSTRALIA.

By Rev. J. Bryant.

The story of exploration in the island-continent of Australia has not received hitherto the interest it deserves. There have been lacking in the story those elements of excitement which go with the discovery of new tribes and conflict with warlike races. The vast loneliness and the far-stretching waterless areas of Australia have made the journals of its explorers monotonous and lacking in incident in comparison. But for grim, unyielding battle with Nature in her most repellent and pitiless forms these journals are a wonderful record. If to-day Australian exploration is on its broader lines complete, it is because men measured themselves like heroes and demigods against the forbidding and almost impossible conditions of the Australian interior. Such names as Oxley, Eyre, Mitchell, Hume, Sturt, Gregory, Stuart, Kennedy, Leichhardt, Burke, Wills, Grey, Forrest, Giles, Lindsay, Wells, Landsborough, not to mention others, make a brave galaxy.

It has to be noted that Australian exploration only dates from 1813. It was in that year that the passage of the Blue Mountains was forced by Blaxland, Lawson, and Wentworth. During the first quarter of a century of the existence of the colony of New South Wales, it was not possible to journey from Sydney by land for more than forty miles in any direction. The first great expedition into the interior was under Oxley in 1817. It was not, however, until 1862 that M'Dowall Stewart on his third attempt succeeded in crossing the continent from south to north. In 1873 Warburton achieved his perilous and all but disastrous

task of crossing from east to west. The exploration of Australia since 1831 has been vigorous and far-reaching. Now it may be reckoned complete on its broader lines. No great geographical discoveries can be in store for later explorers, no inland sea, no broad lakes nor rivers. There remain, however, many details to be filled into the picture sketched in outline by the first explorers. The tracks of the pioneers were of necessity narrow, and often a hurried, forced march from camp to camp. It has been noted specially in the journals of Forrest and of Giles that the two types of country characteristic of the interior, the denuded limestone, with its capacity for fertility, and the sandstone, with its terrible sterility, pass from one to the other very abruptly. Valuable pastoral areas and permanent waters may reward the explorer in the interior still. The tracks of the first explorers should not be looked upon as adequate tests, and the interior thus be judged on evidence so slight.

Exploration in Australia has its martyrs' roll. It is certain that many have met their solitary, unknown fate, leaving no record. But others, such as Leichhardt, have left a story that is not likely to be forgotten. The total evanishment of Leichhardt and his party touched profoundly the sentiment of the nation; while stories of a survivor or survivors among some far inland tribe has opened up a field for romance, but no trace has been found. The story of Kennedy's end in the lonely scrub is known through the fidelity of the aboriginal boy who stood by him to the last. The party struggled in vain against the impassable nature of the awful country that confronted them, and the hostility of the natives, and the ravages of sickness, and two only returned to tell the tragic tale. The disastrous expedition of Burke and Wills yielded fatal tribute to the pitiless interior. On their return from the Gulf of Carpentaria, after a terrible struggle for life, Wills succumbed while his comrades were away searching for food, and two days later Burke died also. Exploration in Australia has had many less conspicuous martyrs, such as Richard Cunningham of Mitchell's expedition, and poor Gibson of Giles's expedition, lost on the arid tract since known as Gibson's Desert. From first to last Australian exploration has been no holiday jaunt, but at the peril of one's life. Was ever such an awful journey as that of Eyre along the shores of the Great Australian Bight? Or was ever a fiercer fight for life against fearful odds than that of Grey in West Australia, or of Warburton in his struggle toward the West? Yet the work of exploration has had a strange fascination, and men, having escaped its perils by the skin of their teeth only, have returned to it again and again, drawn by some grim, irresistible charm.

It is interesting to note how exploration in Australia as it has advanced has been a series of corrections of misconceptions. The first discoverers of Australia, the French and Dutch, despised it, and turned from its inhospitable coasts, little dreaming that they were flinging away what was to be a rare jewel of Britain's empire. England regarded Australia at first only as a safe depôt for her criminal population. The great pastoral plains of New South Wales were declared by Oxley to be "uninhabitable, and unfit for all the purposes of civilised

man." Sturt wrote, with his pen dipped in gall, of country cursed of its Creator. Yet within forty years of Oxley's sweeping condemnation the area of which he spoke was looked upon as the best thus far discovered, and teemed with its flocks and herds. On the very spot where Sturt wrote so bitterly a busy town stands to-day, darkening the sky with smoke from smelting furnaces. These are examples of the later corrections of first hasty misjudgments. Yet these mistakes were not only natural but unavoidable. The first explorers could not possibly have guessed that the indigenous and unprepossessing shrubs of the interior were of the utmost value as fodder plants. The salt bush, for instance, would never be taken at a casual examination to be excellent pasturage for sheep, but quite the contrary. Nor could they possibly have known what a remarkable effect the stocking of the country would have upon it. One sympathises with the earliest explorers in their failure to recognise how valuable their discoveries really were. It is somewhat pathetic to think that Sturt, even as he made his heroic way down the Murray, had his satisfaction grievously damped by the feeling that the country along its banks was worthless!

Preconceived ideas as to the physical conformation of the continent, too, have had to be corrected. Oxley believed in the existence of an inland sea, and expected the Macquarie river to take him to it, a very reasonable theory in itself. The idea haunted Sturt, and he wrote jubilantly of sailing its untracked waters. He, however, just then had the report of his lieutenant, Poole, who, tricked by the mirage, declared that he had actually looked upon the long-dreamt-of sea. It was believed, too, that a great trans-continental range existed—the "backbone" of Australia; and the M'Donnel range was regarded as one of its spurs. The theory of a vast inland desert was held with equal positiveness. The expansion of settlement has already gone far to explode in a most practical fashion this theory.

There yet remain wide areas of only partly explored country, and exploration still has its perils and terrible hardships. The Elder expedition of 1891, under the leadership of Professor Lindsay, did excellent service. Though no geographical discoveries of note were made, a large number of interesting points were defined, and many names placed upon the map. A series of valuable photographs were also secured. Commercial exploration is in the field constantly. The hope of gold discovery is a permanent motive, and an attempt on a large scale was reported a few months ago. An expedition equipped by the Coolgardie Exploration Syndicate was afield for nine months. They had a hard time in crossing the West Australian Desert, no rain having fallen for two years. The Warburton ranges were dry. At Mount Squires, where they hoped to find enough water for a prolonged camp, they found only just enough for the camels before starting again. They proceeded north of the Rawlinson range, and in an attempt to return to Coolgardie nearly perished. They had to retreat to the Rawlinson, where five of the camels were speared by blacks. For three months the party were without meat, and finally reached Oonadatta, on the Overland Telegraph Line, where they disbanded.

The great interior is known, but by no means fully known. In the north of South Australia and in West Australia are tens of thousands of miles just touched here and there by the tracks of Eyre, Gregory, Warburton, Giles, and Forrest. One asks, What is to be the future of the interior of Australia? The extension of artesian boring may be counted on for much. Water for sheep and cattle can be thus permanently secured. But the problem for a great part of Australia is the by no means impossible one of water conservation. The rainfall over a large part of the continent is ample, if only it could be utilised. At present the bulk of it escapes as flood waters. Let these be retained, and hundreds of square miles of barren land can be transformed by irrigation into fruitful fields and gardens. Nature has provided Australia with a wonderful compensation in the way of unequalled provisions ready to hand for water conservation. Natural reservoirs that are dry for years in many cases can be cheaply utilised in flood-time, chains of lagoons lie alongside the rivers, gullies that need only to be dammed across to imprison whole lakes, depressions and channels that lend themselves to easy adaptation, are a feature of Australia. Australia, as she may become, and will become, is, if not wholly (and probably that is too much to look for), yet largely capable of bearing a vast population. There are areas in other countries as arid as the driest of the Australian interior which have been transformed by irrigation into astounding productiveness. Any one who has been, like the writer of this paper, an eye-witness of the magical effect of rainfall upon apparently hopelessly barren country in Australia may be pardoned an exaggerated enthusiasm as to the capacity of such areas under sufficient irrigation. And when it is remembered that the total basin of the Murray is 414,000 square miles, greater than that of the Ganges or Indus, those who have seen it in flood may well look upon it as of enormous possibilities in the way of conservation and irrigation. Nor is the Murray the only water asset on a large scale in Australia. The task of dealing with the dry areas of the great south land is no greater than, indeed not so great as, the task already completed in historic lands of old, and in our own time in such areas as California and Arizona and elsewhere. There can be no doubt that Australia is destined to be inhabited even where thousands of miles lie as yet useless.

NOTE ON DRAFT PLAN FOR INSTITUTE OF GEOGRAPHY.

By Professor Patrick Geddes.

The genesis of this draft plan may be briefly indicated, since it represents the latest of not a few attempts to unite and harmonise many lines of geographical activity and educational endeavour.

The accumulation and arrangement of maps, reliefs, and illustrations, the presentment of descriptive and general geography is primarily centred around the Great Relief Globe of M. Elisée Reclus, which was

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considered and approved by a Committee of the Royal Geographical Society in 1898, and all but realised in the imposing architectural design of M. Bonnier for the Paris Exposition of 1900.

With this is associated as its complement the Celestial Globe already partly realised by M. Galeron. Around this should be placed astronomical collections, together with photographs, star maps, models, and so on. Rooms are provided for the concrete, and, as far as may be, the experimental illustration of the physical phenomena of the universe, as already attempted in the "Urania Museum" of Berlin, and in some measure also at South Kensington, and in the "Palais de l'Optique."

The connection of scenery with geology and geography, which requires for its full realisation not only the photograph or even the relief, but the picture, the panorama, is recognised by providing space beside the terrestrial globe. Here would be displayed such a panorama as that of Mont Blanc by M. Schrader, as yet the highest union of geographic science with artistic power reached by a single individual; and around this a minor panoramic series if possible no less carefully selected and executed, and representing typical regions and landscapes of the world, such as those of the National Pavilion of Sweden in the Exposition of 1900.

But this cosmic presentment of Universal Geography, which sets out from the World as a whole, involves as its complement the converse or human method. This is presented in the Tower, proceeding from the visible and immediate prospect, and its study by help of all the sciences of observation. Thence we descend, storey by storey, through City and Province and Region or State to Nation and Empire, and thence again to the larger Occidental Civilisation, of which these form a part, and finally to the Oriental and Primitive sources—the facts of geography and history, the problems and possibilities of useful activity being also represented, as far as may be, upon each level. Various elements of this arrangement have been already in intermittent progress in the Outlook Tower at Edinburgh.

Returning to the adjacent storeys of the main block, its lower ranges of rooms are associated with the corresponding storeys of the Tower, and supply fuller space for anthropological, historical, and economic geography—for the schools of Ritter, Roscher, and Le Play, their representatives and their rivals.

Finally, in the uppermost range of galleries (not shown in elevation, since lighted from the roof, but broadly corresponding to those of the ground floor, with the addition of their corridors), would be lodged the most complex collaboration of all, broadly corresponding to that of the series of type collections upon a geographical basis so widely discussed at the close of the Paris Exposition, and embodied in the attempt of the International Association to preserve the main buildings of the "Rue des Nations." First of all, of course, should be allotted such space as local conditions may require or allow for an adaptation upon some workable scale, however reduced, of the representative exhibits, and the Information Bureau of the Commercial Museum of Philadelphia, for help and suggestion from which are due special thanks to its eminent director, Professor Wilson.

These galleries of Industry and Commerce naturally lead on one side to that of Education, for which the Bureau of Comparative Education, lately established in connection with the French Ministry of Education, furnishes precedent; and on the other, and no less naturally, to space for a Peace Museum, of which the draft design incorporates and continues that of the late M. Jean de Bloch. Engineering, of course, primarily related to geography, in railways, canals, and so on, "geotechnics" as a whole, afforestation, irrigation, agriculture, and hygiene, tropical and temperate, would all be represented. These collections would find their practical application in the Gallery of Comparative Civics, in which the development, character, and progress of representative cities would be indicated, presumably not without stimulus to our own.

In detailed arrangement, as in the architectural style and ornament in which M. Galeron has expressed it, the present plan is, of course, still open to modification. It is, indeed, under continual improvement, and criticism and suggestion will be welcomed and fully considered. Already no arbitrary scheme, but a product of many independent ideas and efforts, it should thus become increasingly worthy of realisation, upon a sufficient scale of scientific and educational completeness.

A PLEA FOR A NATIONAL INSTITUTE OF GEOGRAPHY.

By J. G. Bartholomew, F.R.S.E., F.R.G.S., Etc.

The love of knowledge can hardly be said to be with us a national ambition. Our having achieved so much material success without study may perhaps account for this defect; we have had more belief in action. In the opening up of the world to civilisation and commerce we have been first in the field, and we have had the enterprise to take advantage of exceptional opportunities. As a nation we have unquestionably made remarkable progress: we have extended our dominions abroad, we have accumulated great wealth. But has our success ennobled our ideals, or has it mainly developed pride, luxury, and self-complacency? Is there not more enthusiasm shown over a yacht race or a football match than over the discovery of a new continent? Our good fortune in the past cannot be expected to continue in the future without effort. In this twentieth century we have to face changed conditions. Even if in spite of luxury we still retain our old hard-working energy, yet energy alone will not suffice. Now more than ever knowledge is power, and the dominating race of the future will require efficiency all round. In the commercial struggle foreign countries, in many respects better equipped for competition, are entering the field to contest the monopolies we have so long enjoyed. In the past the energies of nations and individuals have been mainly limited to their own countries; now their field of action extends over the world. An ever-widening field, a great and complex one, it requires special study, and that study is Geography in its widest sense.

Geography, truly the science of earth knowledge, is the common meeting-ground of the natural sciences, and in so far as history, ethics, economics, and other human sciences are affected by physical conditions, they are related to Geography, which is in this sense the foundation of history and the key to civilisation. Yet it is only beginning to be realised that a certain knowledge of geographical phenomena is a necessary introduction to most branches of study. At the present day no statesman or student of history can have an intelligent grasp of the political evolution of the world without a knowledge of its physical conditions and resources. It is well known that in the past, ignorance of Geography in our statesmen and in the general public has led to the gravest blunders in our foreign policy. We have allowed to pass from us what has been priceless, we have struggled for what has been worthless.

What is true for the statesman holds also in the case of the merchant, the maker of steel rails and bridges, the cotton manufacturer, and others. The knowledge of his own immediate market no longer suffices. The maker of railway materials must keep an eye on Manchuria and Uganda, the manufacturer of lucifer matches should know what is done in Japan. Similarly in every branch of international commerce a knowledge of the products of various countries, the conditions of their further development, the conditions of labour, of transport, the distribution of supply and demand, are all subjects for geographical study. Geography is the basis of commerce, and the merchant who neglects its principles must necessarily be at a disadvantage.

Merchants, home and colonial, ought to know that in this our British Empire, from a geographical point of view, there is no reason why, in regard to food, clothing, and all the necessities of life, we should not, by developing the resources of our own vast colonies and possessions, be quite independent of foreign countries. The question whether our Government should or should not, by preferential tariffs, promote such a development and thereby enrich our own empire instead of foreign states, is largely a geographical one.

These considerations are patent to all geographers. The problem is how to supply the need of the general student whether he be politician, economist, naturalist, or philanthropist; how is he most readily to get a clear and correct conception of the world's conditions as applied to his branch of study? And with the general student we would fain reckon the representatives of every branch of commerce; for unless they learn in future to study in a way they have not heretofore done, British commerce must inevitably decline.

As knowledge increases, as data accumulate, as books multiply, the task of making a comprehensive study of Geography becomes more perplexing and overwhelming for any one but the specialist. We have articles, monographs, text-books, encyclopædias, surveys, maps, atlases large and small, good, bad, and indifferent—their name is legion. We want a key to it all and a geographical censor. We want a grouping and classification of all this material, a synthetic treatment, and at the same time an index, so that we may be guided in following up any special study in its utmost detail, promptly and unerringly—a graphic

encyclopædia, a visualised universe. Such a centre of instruction would enormously simplify, and that in a most helpful and interesting way, a task well-nigh an impossible one for the average man. It would be more comprehensive than the best book, more entertaining than the best illustrated popular lecture: proving the most attractive object lesson, a vast kindergarten for the grown man—yet none the less a centre for the working specialist.

For some time geographers have been struggling towards such an ideal. Can it be realised?

A National Institute of Geography is wanted. It must include a geographical reference library, a geographical reference museum, a geographical reference art gallery—in fact, it should be a Temple of Geography, devoted to the Universe in general and the Earth in particular. Here we should see the world in all its aspects, in all its countries, even in all its detail of survey. On the one hand would be vivid artistic presentment, on the other scientific classification and order. Most people know from experience how difficult it is to get prompt, reliable, and systematic information about foreign countries, and even about our own Empire. Here in our ideal microcosm we might betake ourselves to any part of the world and at once find out all that is known of it from the complete collection of published books, maps, plans, models, photographs, statistics. Surveying the world generally, we should find, summarised as well as in detail, all known particulars of the structure and composition of the solid sphere, the minerals and their distribution, economic as well as scientific; all that we know of its surface relief, the mountains and plains, the waters —rivers, lakes, and ocean depths; all published observations regarding its climates, the torrid and frigid zones, sunshine, temperature, wind, rains, storms, and calms, with their causes and effects. We should find summarised a general survey of its vegetation, the forests and grasslands, cultivated crops and other vegetable products, also of its animal life, indigenous and imported, wild and domestic, with the conditions of its growth. And lastly, we should find all that is known of its human inhabitants, their distribution, population, races, religions, history, civilisation, culture, commerce.

This is a general view, but let us take a concrete illustration; let us consider a great commercial organisation which is turned to little practical account because the results are not readily available and are scarcely known. A constant complaint against our British manufacturers is that they do not adapt their goods to the wants of their customers, or consider their tastes, eccentric or barbaric though they may be. But how is the home-staying Briton to know the tastes of the Peruvian, the Somali, the Manchu, save by the hap-hazard methods heretofore used or by chance paragraphs in the daily press? Now the British Empire has a vast consular system all over the world, and these commercial agents send home reports which are published as Blue Books by our Government. These reports deal with the trade and the possibilities of trade in the countries which they represent. Some of these are worth little, but others are worth fortunes to enterprising merchants.

Yet how few study them, or even know of them! And if they do not know the British reports, they are less likely to know the American, German, and French views of world trade which are no less valuable as practical commercial intelligence for our merchants. These and other great international collections, such as surveys, charts, statistics, photographs, etc., would all be collected, classified, and indexed for ready reference in a bureau of commercial information.

In short, our Institute of Geography would meet the wants of all ages and classes. It would supply much of what is needed to equip us for the practical work of life, and also what might satisfy and refine our leisure, enrich our human sympathies; it would be a temple of science in the truest sense.

It is not our intention in this article to discuss such a project in detail. It is a big scheme, but nevertheless it is simple and practicable. Most of the material for its embodiment already exists, and only requires bringing together, unifying, classifying; by individual effort much progress has already been achieved in this direction. In cartography, for instance, we have Professor Penck's scheme for the unification of our cartographic knowledge upon a world map of the uniform scale of 1 : 1,000,000. We have also the scheme of Professor E. Reclus for the co-ordination of all our geographical reliefs in his great globe on the scale of 1 : 500,000. We have the celestial globe of M. Galeron. Much has been done, but in working towards a complete scheme the most notable effort is that of Professor Patrick Geddes, who has given much of his life to the elaboration of such an ideal. The draft plan for an Institute of Geography which we publish in this magazine is the outcome of his work in this direction, and has been prepared after consultation with the great geographer, M. Elisée Reclus, while its present architectural form is due to the pencil of M. Galeron. The plan speaks for itself, but we publish a note from Professor Geddes in further explanation of it. In its conception the scheme is great, comprehensive, and eminently practical, the inspiration of a geographer and philosopher, and worthy of the coming renaissance of Geography.

Towards the realisation of such a scheme there are two proposals. The first is that some patriotic and wealthy patron should come forward and endow it on a princely scale, either as an independent institute or an adjunct to a great university. The second is that it should be achieved by co-operation on the part of existing institutions and organisations such as universities, geographical and other scientific societies, chambers of commerce, emigration agencies, etc.

From this point of view there are many indications that the time is ripe for the serious consideration of such a scheme. Throughout Britain and Greater Britain it is indeed reassuring to see considerable activity in the creation of provincial universities, geographical societies, museums, and research associations. Nevertheless, while these continue to pursue their separate ways and to fulfil the special requirements of their own districts, much would be gained by united effort towards realising a great ideal. Much dissipation of energy arises through lack of combined effort, through overlapping of expenditure in attaining ends which by

co-operation could be achieved on a grander scale to mutual benefit. The leading societies are perhaps responsible for this, as it rests with them to approach the provincial societies with a practical scheme.

As a first step towards the realisation of this ideal, a federation of the geographical societies of the Empire might, with unanimity of purpose and concerted action, lead to great achievements. And if the Government would make over the Imperial Institute to an Imperial Geographical Society, with branches and correspondents throughout the Empire, we have little hesitation in predicting that as an institute of practical geography, an empire museum of commerce, a bureau of geographical information, it would play an important part in the economy of the empire, and form a valuable adjunct to the Colonial Office and other departments of imperial administration.

Instead of various minor geographical magazines, and consequent overlapping of information, such a Federation might publish monthly a special Journal of Scientific Geography, also a Journal of Educational Geography, and weekly or fortnightly a Journal of Commercial Geography, members of the various associated societies receiving one or more of these publications according to arrangement.

To the realisation of such a scheme of federation we see no serious obstacle, and we would commend it to the consideration of our leading geographical society.

In conclusion we would say that this is no quixotic project, no utopian dream. It is proposed in all seriousness as a practical scheme for immediate realisation. And if it be worthy of realisation, why should we not do it on a big scale? What is one or two hundred thousand pounds spent on such a scheme, that will advance material welfare while diffusing culture and international sympathy, against the hundreds of millions squandered on war, on luxury and indulgence?

As a nation we are growing in material wealth and power, but if our higher ideals are not more to us than our pleasures, surely we are unworthy of our greatness.

PROCEEDINGS OF THE ROYAL SCOTTISH GEOGRAPHICAL SOCIETY.

Meetings in February.

On the 4th February, the Earl of Ronaldshay addressed the Society in Aberdeen on his "Journey from Quetta to Meshed *viâ* the new Nushki-Sistan Trade-Route." The Chair was taken by the Rev. Professor Pirie. Lord Ronaldshay repeated his address in Edinburgh on the 6th, when the President of the Society, Sir John Murray, K.C.B., was in the Chair.

On the 13th, in Edinburgh, Commander B. Whitehouse, R.N., read a paper entitled, "To the Victoria Nyanza *viâ* the Uganda Railway." The Rev. Dr. James Stewart, of Lovedale, South Africa, presided. At this meeting the following alteration of Laws, proposed by the

Council, and of which notice had been duly given at the previous meeting held on the 6th, was carried unanimously :—

Law XXVI.—*For the words* "A single payment or donation of not less than Ten Guineas shall constitute the subscriber a Life-Member," *substitute the following*

"A Member may compound for Life-Membership by payment as follows, viz :—

"1. When under 10 years' standing, ... £20
"2. When over 10 and under 20 years' standing, . . £15
"3. When over 20 and under 30 years' standing, . . £10
"4. When over 30 years' standing, ... £5"

On the 20th, in Edinburgh, Professor Robert K. Douglas read a paper on "China Past and Present," the Chair being occupied by Sir John Murray. Professor Douglas repeated his address in Glasgow on the 24th, when Mr. Robert S. Allan presided.

On the 21st, in Dundee, the Secretary of the Society, Colonel Bailey, showed a series of lantern slides, prepared from photographs taken by himself during a journey across Canada from the Atlantic to the Pacific. The Chairman of the Dundee Branch, Mr. I. Julius Weinberg, occupied the Chair.

Scottish Antarctic Expedition.

The sum of £50 has been received from an anonymous donor for the Scottish Antarctic Expedition.

NOTES OF PAPERS READ BEFORE THE SOCIETY.

THROUGH THE YANGTSE GORGES.

By Mrs. Archibald Little.

The Yangtse river rises in the same region as the Mekong and Salwen, and then, making a rectangular bend past the Lolo mountains, runs almost due east, dividing the eighteen provinces of China into two approximately equal parts. For years past there has been regular steam communication as far as Hankow, which is 700 miles up the river, and is the great centre of the tea trade, but Mr. Archibald Little was the first to induce steamers to run in the winter time when the water is low, between Hankow and Ichang, which is 400 miles further up. This he accomplished by running his own little steamer over this reach all the year round. Subsequently, he turned his attention to surmounting the difficulties of the Yangtse Gorges, and so running steamers up to Chungking, the commercial capital of Szechuan, which is 500 miles further up. In the spring of 1898 he first succeeded in taking up a little steamboat—ss. *Leechuan*—into the port of Chungking. The boat was built at Mr. Little's expense, and he himself acted as captain, not having even a European engineer to assist him. On his arrival in the port he was presented with an address of congratulation at a public reception

held in his honour. In 1900 H.M.S. *Woodcock* and *Woodlark* steamed up to Chungking, and continued their journey for 400 miles further up to Suifu. On June 20th of the same year—an *annus funestus* for China—Mr. Little brought up to this port the ss. *Pioneer*, built by Denny Brothers of Dumbarton, with cargo and passengers. The boat was then detained by the British Government, and hired for the protection of British subjects. It then made the journey down to Ichang again, arriving there with 100 European refugees and all their impedimenta. Subsequently the boat reascended the river with the Consul and the Customs and Postal Officials, all under orders to return to their posts, making the upward journey in nine days. The boat was subsequently purchased by Government, and transformed into H.M.S. *Kinsha*, which is a guardship for the Upper Yangtse.

The next event in the progress of navigation in the Upper Yangtse was the building by the Germans of a steamer to be used in those waters. This boat unfortunately went to the bottom with her captain and all her cargo at the first rapid, just at the entrance of the lovely Niukan Gorge. Undeterred by this misfortune, the Germans are building another cargo and passenger steamer, as are also the Japanese; facts which indicate the commercial advantages which the navigation of these waters is likely to bestow, and thus illustrate the value of Mr. Little's pioneer work.

Mrs. Little showed on the screen numerous views illustrating her husband's travels in the Yangtse Gorges, and then passed on to some description of the beautiful Sacred Mountains, as described in her husband's volume entitled *Mount Omi and Beyond*. She drew special attention to the discovery by Mr. Little of coloured limestone basins, similar to those which formerly existed in New Zealand.

Speaking of the effect on the Chinese people made by the efforts of traders, missionaries, and others to produce new needs and new habits of thought, Mrs. Little emphasised especially the work of the Christian Literature Society for China, and its influence on the young men of China. This Society has now won the support of the great Viceroy, Chang-chits-ting, and of other governors of Chinese provinces. In conclusion, Mrs. Little showed the shot-marked front of the Northern Cathedral at Peking, which has passed through one of the most miraculous sieges recorded in history, and said that those gunshots had been like an electric call, summoning the civilised nations to force the Chinese into new ways.

ANNIVERSARY MEETING.

At this meeting, held on January 23, Sir John Murray occupied the chair, and in his opening address, after welcoming the fellows and members of the Society, congratulated them on its continued success and prosperity and continued usefulness. He pointed out that during the past session Edinburgh and the branches of the Society in Glasgow, Dundee, and Aberdeen have been supplied with a most excellent and

instructive series of lectures; the *Magazine* has also throughout the session maintained its well-merited reputation, and the Hon. Treasurers, Mr. Reid and Dr. Gourlay, report that the finances are in every way satisfactory. The Council of the Society, both as a corporate body and as individuals, have taken throughout the session an active interest in everything that concerns geographical knowledge and research in Scotland. Among other things which have engaged their attention may be mentioned, first, an endeavour to produce a detailed topographical description of the valleys of the Forth and Clyde in connection with the Scottish Natural History Society and the Marine Biological Association of the West of Scotland; second, the carrying out of the physical, bathymetrical, and biological survey of the Scottish lochs, initiated by himself and the late Mr. Fred. Pullar; and thirdly, the equipment of Mr. Bruce's Antarctic Expedition. It is now definitely arranged that this last-named shall start from Scotland on August 15 next, after two or three weeks' cruising in the Atlantic in order to test the gear of the ship and the instruments for oceanographical research. This list will give some idea of the subjects at present engaging the attention of the Council. The Society now offers many privileges to its members, and all those interested in the progress of scientific research, and the spread of geographical knowledge in Scotland, are strongly urged to join it as the best means of forwarding these ends. It is to be hoped that some day some patriotic Scotsman will present the Society with £30,000, in order that it may possess a building of its own in which rooms will be set apart for chart and map work, for the display of instruments, and for the practical instruction of students, teachers, and intending travellers in scientific geography.

Sir John Murray then went on to speak of the Livingstone Medal, which, as already indicated, has been founded by Mrs. Livingstone Bruce in memory of her father, the distinguished explorer, and of which the first award has been made by the Council to Sir Harry Johnston, in acknowledgment of his services as explorer and administrator. This medal was figured in the February number of the *Magazine*, and as is there seen bears on the obverse side a portrait of Livingstone, and on the reverse an allegorical representation of the Spirit of Civilisation bearing the torch of progress and the olive branch of peace. The appropriate nature of the first award is very obvious when the fact is recalled that Sir Harry Johnston, who is one of Livingstone's biographers, may be said to have continued that explorer's work as a pioneer of civilisation in the dark regions of Africa.

Mrs. Livingstone Bruce then handed the medal to Sir John Murray, who in his turn presented it to Sir Harry Johnston. The latter, after expressing his thanks and high appreciation of the gift, delivered an address on "The Protectorates of Great Britain in Tropical Africa," already reported in full in the *Magazine* for last month. A vote of thanks to Sir Harry Johnston was afterwards proposed by Professor Butcher, and seconded by Mr. J. W. Moir.

GEOGRAPHICAL NOTES.

EUROPE.

Morphology of Caucasus.—Professor G. Richter points out that Merzbacher's recent work, *Aus den Hochregionen des Kaukasus*, repeats the familiar statement that the Caucasus Mountains are devoid of lakes and waterfalls. This is a very remarkable fact, for the Caucasus consist for the most part of a true mountain chain, like the backbone of the Alps, and, no less than the Alps, they have been subjected to glaciation. Now lakes and waterfalls, when found among the higher mountains, are signs of glaciation, so that their absence in the Caucasus remains to be accounted for. The author is of opinion that lakes do exist there, and will be found when explorers devote attention to the lateral valleys, in place of confining themselves to the regions still occupied by glaciers. He compares our knowledge of the Caucasus with that which would have been obtained of the Alps if exploration had been confined to Chamonix, Zermatt, and the Bernese Alps. Similarly, Richter believes that, rightly directed, exploration will also reveal waterfalls in the region of the Caucasus. There can be no doubt that marginal lakes ("Randseen") are absent in the region, and this certainly proves that the glaciers did not extend down over the plains. All the Swiss marginal lakes of large size lie in moraines at the end of old glacier beds, and where, as in the case of the Mur and Enn glaciers, the glacier stopped in the mountains, then lakes are absent. The glaciers of the Caucasus must therefore have been of this character.—*Geographische Zeitschrift*, vii.

Census of France in 1901.—V. Turquan sums up the results of the census of last year from the official figures. In March 1901, France contained, inclusive of the members of the Chinese corps, and of members of the navy absent on duty, 38,641,333 inhabitants, as compared with 38,228,969 in 1896, being a gain of 412,364. In twenty-eight departments there was an increase of population, and in fifty-nine a decrease; the average gain in the former group was 25,200, the average loss in the latter 6000, facts which show that in France also there has been increasing concentration of the population in the parts already densely populated, and widespread decrease in the regions already sparsely inhabited. That the increase in the departments which are increasing is usually due to immigration, and not to a high birth-rate, is shown by the case of Seine-et-Oise, where the deaths are in excess of the births, and yet the population is increasing at the rate of forty-nine per 1000. The greatest decrease has taken place in the department of Lot, whose population is diminishing at the rate of sixty-one per 1000, a decrease due both to a low birth-rate and to emigration. A decrease first appeared in this department in 1861, and since 1881 has become more and more marked. Comparing the census of 1801 with that of 1901, it is found that sixteen departments had in 1801 a larger population than at present, the remainder had a smaller. The population of the Eure has diminished by 70,000 in 1901 as compared with the population in 1801. On the other hand, the Seine has increased more than fivefold, the Rhone and Bouches-du-Rhone have almost tripled their inhabitants, the Loire and the Nord have almost doubled theirs. The gain of 412,000 souls, experienced in the last five years, has been absorbed by the towns of over 25,000 inhabitants, and of these many have experienced a proportionately greater increase than the capital, the greatest increase being seen at Boulogne-sur-Seine, where it is 295 per 1000, as compared with 59 per 1000 for Paris.—*La Géographie*, January 1902.

Palæolithic Man in Croatia.—Emil Schmidt points out that while man is known to have existed in the Ice Age in many parts of Western Europe, but little has been hitherto known in regard to his presence at that period in Eastern Europe. Recently in Krapina, in the north-west of that Province, a cave has been found containing many bones of animals belonging to the Glacial Period, with bones and implements of Palæolithic man. Among the bones are those of cave-bear, urus, rhinoceros, deer, marmot, and bear, an assemblage which indicates that the deposit belongs to a warm interglacial period. The implements and weapons are of a very primitive type, and the number of human bones split and marked with fire suggests cannibalism. In character the human bones, on the whole, are of much the same type as those found in the caves of the Lower Rhine and of the Maas, although differing in some particulars, especially as regards the teeth.—*Globus*, lxxxi.

ASIA.

German Colony of Kiao-chau.—M. André Brisse gives (*Revue de Géographie*, xxv., 1901) an interesting account of the progress of this colony. The bay was first occupied on 14th November 1897, and since that date remarkable changes have been produced in the vicinity. In place of the Chinese village of Tsingtau, there has been erected a modern town, of entirely European aspect, lighted by electricity, possessing a railway and telephone service, and looking over a harbour now visited by large steamboats and warships.

The territory, placed under the protection of the German Empire on 27th April 1898, consists of the Bay of Kiao-chau with the contained islands, the peninsula of Hai-hsi to the south of the bay, the territory of Tsingtau s. str., and the islands to the south of it which command the entrance to the bay. This area is bounded by a neutral zone, virtually under German protection, in which lies the Chinese town of Kiao-chau. The climate is considered fairly healthy, and modern hygiene has already diminished the virulence of the prevalent dysentery and typhoid. The population of the protected region includes about 80,000 Chinese, 1600 German soldiers, and some 200 civilians. The harbours of the bay have proved disappointing, but this difficulty is being overcome by the construction of two artificial harbours, the one of which will have a depth of 10 metres and the other of 6 metres. It is expected that the former will be completed in 1906.

Before the German occupation the land had been almost denuded of trees and of turf, and in consequence much of the soil had been removed by torrents. The administration has devoted much attention to planting, both with evergreen and deciduous trees, and has taken precautions to prevent the removal of the surface soil by water. In places the soil is fertile, but there is no evidence of mineral wealth, nor of coal. Both iron and coal are, however, abundant throughout the province of Shan-tung. Apart from the necessity of converting Kiao-chau into a port of call for the fleet, the object of the Germans is to tap the resources of this province, which, it is hoped, may be done by the railway in course of construction from Tsingtau to Tsinan-fu. As yet the commerce of the colony has been of little account.

Ascent of Gunong Tahan.—In the *Singapore Free Press* (28th November 1901) an interesting account is given of the first ascent of this mountain, believed to be the highest peak of the Malay Peninsula. The ascent was made by Mr. John Waterstradt, who left Singapore for Kota Bahru, the capital of Kelantan, in April last. Thence he ascended the Lebeh river to Aring, and after following the river

of the same name for some distance, struck through the jungle towards an unknown range of mountains, which were found to reach a height of 4000 to 6000 feet. As the ascent of the mountain believed to be Gunong Tahan proved to be impossible from this point, the range was crossed and a descent made into the valley of the Tahan river. After following this river upwards for some distance, a high peak was ascended, from which a distant view of the true Gunong Tahan was obtained. As its ascent from this point appeared impossible, the party returned to Kota Bahru, and started afresh up the Galas river as far as Pulai. After a preliminary expedition to a mountain in the vicinity of this settlement, the party finally set out for the mountain of their search, whose base was reached after a heavy march of fourteen days. Owing to the heavy jungle, the ascent took four days, although the aneroid only showed a height of 7500 to 8000 feet, considerably less than was anticipated. During the ascent, at a height of about 1500 feet, a piece of quartz heavily streaked with gold was found, to some extent confirming the native traditions of the mineral wealth of the mountain. A fortnight was spent on the summit, but the weather during the whole time proved very wet, the mountain being entirely bathed in mist after the early morning. Mr. Waterstradt considers that the mountain does not, as has been supposed, form a part of the central range of Kelantan and Pahang, but is an isolated peak. The ascent from the Kelantan side presents no special difficulties, if a sufficient supply of provisions be taken, while that from the Pahang side seems impossible.

Among the Natural History specimens obtained on the mountain was a very fine new species of pheasant, the male measuring from beak to tail fully five and a half feet. Some other new species of birds were also obtained.

The Colonisation of the Kirghiz Steppe.—M. Paul Labbé gives an interesting account of the changes which are taking place in this region owing to the influx of Russian emigrants. The inhabitants may be divided into three sets—(1) the native Kirghiz, (2) the Cossacks, (3) the Russian peasant settlers—all differing markedly from one another in their mode of life. The Kirghiz are nomad herdsmen, owning vast flocks of cattle, sheep, and horses, which they have been able to maintain hitherto owing to their constant movements in search of fresh pasture. But the land is by no means equally fertile in all parts, and in many districts suffers greatly in the summer from want of water. In consequence the new settlers have seized upon the fertile tracts, and as they are agriculturists rather than a pastoral people, each new settlement means a loss of pasturage to the Kirghiz flocks. The Kirghiz show no aptitude for any occupations save the rearing of flocks and hunting, they depend entirely on their flocks and the products of the chase, and as yet have shown little desire to acquire Western ideas, so that there seems reason to believe that as the land over which their flocks and herds once roamed becomes gradually enclosed, and the flocks in consequence diminish, the race must also dwindle and disappear.

The Cossacks of the steppe, in spite of their cruelty and harsh treatment of the Kirghiz, have inflicted less permanent injury on them than the more peaceable peasant emigrants. Essentially soldiers, the Cossacks have never devoted much attention to agriculture, but occupy themselves in fishing, hunting, gardening, and bee-keeping.

The number of Russian peasant emigrants increases year by year, 24,602 having entered the country in 1900. It is this rapid increase which is leading to the gradual enclosure of all the more fertile lands. As a whole the emigrants seem to prosper in their new home, though the scarcity of water is severely felt in many places. It has been decided to dig wells where this need is most felt, but as yet

no practical steps have been taken in the matter. M. Labbé believes that the region presents admirable commercial opportunities. As in many other parts of the globe, these opportunities seem to have as yet been most successfully seized by the Germans.—*Questions Diplomatiques et Coloniales*, v. 1901.

Meteorology in Mysore.—We have received the Annual Report for 1900, containing the results of observations at Bangalore, Mysore, Hassan, and Chitaldrug. The tables show that the mean temperature for the year has been abnormally high, the year mean for Bangalore having been 1·1 in excess of the mean for the years 1893-1900. The humidity for the year was below normal, as might be expected from the abnormally high temperature.

Lake Telezkoje in Altai.—P. Ignatow, with a party of students and others, made an excursion last summer to this lake, which has not hitherto been explored. It is one of the most important sources of the Obi, and lies at a height of 460 metres above sea-level. It proves to have an elongated and curved shape, the length being 78·5 kilometres and the breadth 0·3 kilometres at the west end, and 5 kilometres at the southern end. The greatest depth is 318 metres, and the water is very cold, the temperature at the end of July being only 4° C. The banks are very lofty and almost perpendicular, save in a few places, where they showed a gentle slope. The steep banks consisted of schist. The chief affluent of the lake is the river Tschulyschman, which arises near the Chinese border from Lake Djujlju-kol, which lies on a plateau 2300 metres above sea-level. This plateau is to be regarded as the former bed of a glacier. In the vicinity eight mountain lakes were observed. The collections of the expedition are rich, but are not yet worked out; among the zoological specimens are many new species of fish. A point of much interest is that the reindeer here reaches the 50th parallel.—*Petermann's Mitteilungen*, xlviii.

Travels in China.—Mr. Thomas R. Smith, in lecturing before the Society on January 9, described the general appearance of the city of Pekin, and a journey from it to the Ming Tombs, in front of which stands a long row of large stone animals. Mr. Smith also described the Nan Kow Pass, down which runs the great trade-route from Kalgan. The pass is heavily fortified, and is crowned by the Great Wall.

Dr. Sven Hedin, who arrived at Ladakh on December 19th, has telegraphed to King Oscar to say that he has made an extremely important journey through the whole of Tibet, disguised as a pilgrim, and accompanied by two followers. On approaching Lhasa, they were recognised and captured, but were well treated by order of the Dalai Lama. A second attempt was entirely unsuccessful, and led to the loss of Dr. Hedin's collections, and almost all his caravan, but his notes were saved.

AFRICA.

Present Position of Lagos Colony.—Sir William MacGregor, at the Inaugural Meeting of the Lagos Institute in October last, read a paper on this subject, of which a full report has been sent to us. The territory of Lagos consists of the colony proper, which has a superficial area of 3460 square miles, and of a Protectorate which has an area of about 25,450 miles, giving a total superficies which is nearly equal to that of Scotland. Of the total area some ninety per cent. is fit for cultivation of some kind. The sea-frontage includes only one harbour, and this, owing to a shifting bar, is accessible only to vessels drawing from ten to fourteen

feet of water. Telegraphic communication with Europe can only be obtained at almost prohibitive rates, but it is hoped that this may be altered in the near future. As to government, Sir William MacGregor is of opinion that the position of the hereditary chiefs should not only be sustained, but should be steadily and consistently strengthened and developed, and that these chiefs should be made legally responsible for the administration of their provinces. The public debt amounts to £1,053,700, or fourteen shillings per head of the entire population; the money has all been expended on railways. Since March of last year the rail way from Lagos to Ibadan has been working, and an extension to Ilorin is projected, but the governor is of opinion that it is necessary to contemplate in the future a further extension from Ilorin into the heart of Northern Nigeria. The total population of the Colony and Protectorate is 1,500,000, of which 308 are Europeans, 233 of these being resident in Lagos. In Lagos and its suburbs the general death-rate is 47·3 per 1000, while among Europeans it reaches the high rate of nearly 1 in 10. Improvements in this respect can only be hoped for through attention to sanitation, especially the obtaining of pure water, the filling up of swamps, the regulation of sewage, and the destruction of the breeding-grounds of mosquitoes. In regard to the last point, the measures already adopted have led to a sensible diminution in the number of mosquitoes.

Irrigation in South Africa.—Mr. W. Willcocks has presented to Lord Milner a report on this question, as the result of his investigations conducted in Cape Colony, the Orange River, and the Transvaal. Some extracts from this report are given in the *Times*, February 3. Mr. Willcocks points out that in regard to farming, South Africa has remained in a strangely stationary position during the last fifty years. Then, as now, it requires a farm of 5000 acres to support a family in decent comfort, while the farmers continue to trek from the high to the low veldt, according to the seasons, as the Arabs of the desert have done for centuries. The cause of this is to be sought in the fact that while rain is erratic and uncertain at the sowing season when it is most wanted, it is constant and heavy in the autumn when it is useless, and the present irrigation laws are unwise and unsuitable, causes which combine to make agriculture of an advanced type impossible. Except in the south-west corner of Cape Colony, in half the Orange River Colony, and in the high veldt of the Transvaal, the agricultural development of the country depends entirely upon irrigation. In almost the whole of the Transvaal, in the greater part of the Orange River Colony, and over wide areas of Cape Colony, the rainfall is sufficient even in the worst years to allow of the storage of water on a large scale. Roughly speaking, by means of its rainfall and the Orange River, Cape Colony should be able to secure the perennial irrigation of 1,000,000 acres, the Orange River Colony of 750,000 acres, the Transvaal of 500,000 acres in the high-lying regions, as well as some 1,000,000 acres in the low tracts.

High Plateaus of Natal.—Mr. Emile Macmaster, on January 14, read a paper on this subject at the Royal Colonial Institute, and gave a very favourable account of the prospects of the colony. At Maritzburg the plateau stands at a level of 3000 feet, and is well cultivated. North of Maritzburg the 4000 feet plateau is encountered, a region covered with grass and acacia trees, while another thirty miles northwards brings the traveller to the 5000 feet plateau, which is also grassy, but has fewer trees. This high plateau is eminently well adapted for stock-farming, and has a fine climate, save that the winter nights are very cold. The resources of the land in Natal are twofold; much of it is well suited for agriculture, and the less fertile regions contain coal and iron side by side.

Mr. MacMaster expressed the opinion that while, except in coal and iron, the country is not likely to yield large fortunes, yet the conditions are such that small and moderate fortunes are readily obtainable by persons with some capital.

The French Congo.—M. Aspe Fleurimont discusses the causes of the comparative failure of this colony, and suggests a cure for its chief troubles. In July 1898, owing to the then gloomy financial condition of the colony, the French Administration resolved to begin a system of land concessions, in order to encourage settlers. But the number of applicants was so large, that the ministry drew up a series of regulations to which all must conform. These were of such a nature that many of the most desirable of the intending settlers withdrew their applications, on the ground that the conditions could not be carried out. One of the conditions was that, as in the Congo Free State, so many fresh trees must be planted for every ton of rubber exported. But while in the Congo Free State this could be done by native labour, no similar permission was accorded in the French colony.

Again, many of the new colonists were seen from the first to be ignorant and incompetent, and they did not receive from the local authorities the assistance which was expected. A large number of the military stations, established in order to protect life and property, were suppressed by order of the Government, and when disturbances arose in consequence, the Commissioner-General allowed the settlers to obtain the protection again, but only on condition that they themselves bore all the expense. Another grievance was the right claimed by the government of calling into requisition the river-boats of the settlers. On the whole, it must be said that the local administration in many respects failed in its duties.

M. Aspe-Fleurimont considers that to cure the existing troubles of the colony, it is necessary first that the administration should not rest satisfied with putting the settlers into nominal possession of their holdings, but should give them both material and moral support. Second, what is known as the "organisation of manual labour by means of the capitation-tax paid in kind" should be carried into effect. This was an arrangement whereby the natives were to pay over a capitation-tax, consisting of rubber, ivory, etc., to the settlers on whose concession these products were obtained, and these would, in return, pay the tax in money to the authorities. In this way the natives would become accustomed to labour, and would learn to appreciate its value. Finally, it is necessary that a parliamentary vote should relieve the colony of cares connected with the budget, and set it free to develop its great natural resources.—*Questions Diplomatiques et Coloniales*, v. 1900.

Expedition to Sahara Desert.—Mr. Edward Dodson has recently returned from an expedition to the Hinterland of Tripoli, a region which has hitherto been forbidden ground. The expedition was organised by Mr. J. I. S. Whitaker, and was sent out under the auspices of the Natural History Museum. Though, from the standpoint of natural history, it yielded less than was expected, yet Mr. Dodson succeeded in mapping a large amount of new country, and in making considerable alterations in existing maps.

After some preliminary difficulties with the Turkish authorities, the party started from Tripoli with eight camels, three horses, and nine Arab servants, and entered upon the great desert eight days after leaving this town. The great heat, want of water, and blinding sand-storms, made the journey one of great difficulty. Water was only obtainable at places ten to twelve hours distant from one another. Two weeks after leaving Tripoli, Sofejin was reached, after a journey of about 120

miles to the south-east. Beyond Sofejin a detour was made, in order to strike a Roman reservoir where it was expected water could be obtained. The reservoir, a wonderful piece of ancient stone work, was found to be in a remarkable state of repair, the cement being as good and the structure as watertight as ever. On the journey to it the party were surprised to find the dried beds of the torrents containing great patches of brilliantly coloured flowers. Close inspection showed that these were of the nature of "everlasting" flowers, and were completely dried up by the heat and drought. After obtaining supplies of water from the Roman reservoir, the party struck out for the Bonjem oasis, which is on the direct track to Sokna, their destination. They hoped to obtain fresh supplies of food and water at the oasis, but were dismayed to find on their arrival that the people there were themselves starving, being chiefly dependent on snails and date palm-juice. The buildings at Bonjem, which date from the Roman occupation, afforded a striking contrast to the miserable structures built by the Arabs. The former were in an excellent state of repair, and one was found to cover an area of 3600 square yards, having a gateway twelve feet thick.

From Bonjem to Sokna was a four days' journey, through an absolutely uninhabited desert, and as the party was without water, the journey was continued day and night in the intervals between the sand-storms. The expedition arrived at Sokna—a small oasis with a population of 2000 and a Turkish garrison of 200 men—in a thoroughly exhausted condition, and were obliged to remain there a week in order to recruit. The journey was then continued to Murzuk, some 300 miles farther south. The chief events of this section were the crossing of the Jibil Soda or Black Mountains, and the passing through a great petrified forest. The Black Mountains consist of great slabs of perfectly black stone, and are very difficult to cross. The journey through the petrified forest lasted ten hours. The trees were all lying prone, and varied in circumference from seven feet to a few inches; they were mingled with marine shells, showing that this region of the desert has been at one time submerged beneath the sea.

Leaving Murzuk the party retraced their steps to Sokna, and then, by a different route from that traversed on the outward journey, returned to the coast, which was reached at Ben Ghazi.—*Scotsman.*

Is Tanganyika an Old Sea?—Dr. Ernst Stromer (*Petermann's Mitteilungen*, xlvii., 1901) returns to the discussion of this interesting problem. The evidence upon which a decision can be based is obviously of two types, the zoological, that chiefly relied upon by our English authority, Mr. J. G. S. Moore, in his affirmative answer, and the geological, to which Dr. Stromer now calls special attention. In addition to the fresh-water fauna which it shares with the other great lakes of equatorial Africa, Lake Tanganyika, as is well known, contains a large number of peculiar forms, whose affinities appear to be distinctly with marine forms. These peculiar forms live chiefly in the deep water, while those which inhabit the surface waters are the ordinary fresh-water types. The deep-water animals show a striking affinity to certain Jurassic fossils, and in consequence Moore has suggested that the lake is the remains of a Jurassic sea, a suggestion previously (1882) made by J. Thomson. According to Moore's suggestion, the Jurassic sea flowed over the Congo basin eastwards to the present site of Tanganyika, which owes its origin to a subsequent depression in this sea. But Stromer holds that there is no evidence of such an extension of the Jurassic sea, for there is no trace of marine Jurassic rocks in West Africa either on the coast or inland. Indeed, Neumayr believes that in Jurassic times an extensive continental ridge connected

West Africa and Brazil, a view which is entirely incompatible with Moore's. Stromer believes that the apparent resemblance between the deep-water organisms of Tanganyika and marine Jurassic fossils may perhaps be explained as due to atavism, to convergence, or some other cause, but admits that the geology of Central Africa is too inadequately known for any definite conclusion to be reached meanwhile.

AMERICA.

Giant Trees of California.—Emil Berdau gives an interesting account of these trees, which are now found only in a very limited area, and will probably soon disappear. The annual rings are very clearly marked, and by counting these the age of the trees has been computed at 5000 to 9000 years. The bark, which may be one and a half metres thick, is as hard as stone, and successively resistant to the action of fire, as well as to plant parasites of all kinds and wood-boring insects. The dimensions of some of the giants may be given. Thus, the "Miner's Cabin" was a hundred metres high, and at the surface of the ground measured ten metres in diameter apart from the bark; it fell to the ground in 1860. The "Grizzly Giant," which is still standing, measures twenty-nine metres in circumference at the ground, and eighteen metres at a height of 3·4 metres. This tree stands in the Mariposa Grove, which still contains ninety to a hundred of the giants. On the whole, those contained in this wood are smaller than those of the Calaveras Grove, which now belongs to a Lumber Dealers' Association, and in which "Old Hercules" formerly stood. It was 107 metres high, had a circumference of 71 metres at the base, and in its fall destroyed 174 surrounding trees, and shook the ground as with an earthquake within a radius of half a mile.—*Petermann's Mitteilungen*, xlviii.

AUSTRALASIA.

Former Land Connections in Southern Hemisphere.—Professor Simroth gives an interesting account (*Geographische Zeitschrift*, vii.) of the views held respectively by zoologists and geologists on this subject; for here as elsewhere the theories of the two cannot be reconciled with one another in the present state of knowledge. Mr. Charles Hedley, who has had much collecting experience in the vicinity of Australia, holds that the facts of zoogeography are entirely opposed to the hypothesis that much of the Pacific was filled in Jurassic times by a continent which stretched from the Australian region to South America. There is much affinity between the fauna of Queensland and that of New Guinea, showing that in geologically recent times the Torres Strait was dry land. Again, there is similar affinity between the fauna of the south-eastern region of New Guinea and that of the Louisiade Archipelago, while a line of animal and plant migration can also be traced from Kaiser Wilhelm's Land to the Solomon Islands, where it divides, one branch passing to the Fiji Islands, and the other, gradually weakening in intensity, to the New Hebrides, New Caledonia, and downwards to New Zealand. On the basis of these facts, Mr. Hedley therefore draws the line of the old Australian continent as extending in a very irregular form to include all the islands named above, with an eastward extension to Fiji, and a southern to New Zealand and the Antarctic. He maintains that the islands beyond this old continent, *e.g.* Marshall, Gilbert, Ellice, Samoa, Cook Islands, and so on, are all truly oceanic, and have not had any former continental connection. Not only can the animals present in these islands be regarded as having been introduced by passive means, but there is little if any trace of affinity with South American forms. On the other hand, Dr. Carl

Burckhardt finds that the geological structure of the west coast of Chile is such as to leave no doubt that in the Jurassic period that coast formed the eastern margin of a great continent, whose waste formed beds of conglomerate, hundreds of metres thick. The western boundary of this continent is uncertain, but the view that it extended to New Zealand has some plausibility, and this is in direct contradiction to Hedley's views. For the settlement of the question we must wait for a geological survey of the Antarctic.

Artesian Waters of Australia.—Mr. J. P. Thomson has contributed to the *Queensland Geographical Journal* for the current year a paper on the climate of the different provinces of Australia, and the possibility of irrigating the desert tracts by means of Artesian water. Boring has been most successfully tried in the western districts of Queensland, and of the area in that state which consists of Cretaceous strata, some 106,000 square miles are known to be water-bearing. Elsewhere less success has attended experimental boring, the water obtained in New South Wales, for example, having always been salt, but the author believes that the prospects are good for South and Western Australia. He sums up the question as regards the continent generally as follows. The great central basin of Australia, as well as the lateral valleys of depression, are surrounded by a rim of impervious granitoid Palæozoic and Mesozoic rocks, except at the head of Spencer's Gulf and at the mouth of the Murray river. During the Cretaceous period the lateral valleys and central depression received a load of detritus carried down from the adjacent mountains, and much of this detritus formed the water-bearing beds of sand and gravel which are now spread over the area. These beds of coarse material were followed by fine clay and shale which formed impervious beds on the top of the water-bearing strata, the beds being thin in the centre of the depression, and thickest at its periphery. In consequence, near the centre of the depression natural springs and wells occur, owing to the thinness of the overlying sheets of clay, while in other regions the superficial layers must be bored through before the imprisoned water can escape. It has been supposed that there is a submarine leakage of the water-bearing beds beneath the sea in the form of submarine springs, but the author is of opinion that this is not so, and that the surplus water is got rid of by the enormous amount of evaporation which occurs, both of the rainfall and of the leakage which takes place wherever the superficial impervious beds are weak. Owing to the manner in which the Cretaceous beds were deposited, the coarser and pervious beds crop out at higher levels than the fine-grained impervious strata, and it is these pervious outcrops which absorb the rainfall, and transmit it to the lower levels, where it may be tapped by boring. The opinion expressed by Mr. Thomson that submarine leakage of the Artesian waters does not occur to any appreciable extent is confirmed by the discovery of subterranean lakes in the district north of the Great Australian Bight, a discovery recorded in our November number.

POLAR.

Scottish Antarctic Expedition.—The plans of the Scottish National Antarctic Expedition are steadily advancing. On the 10th February Mr. Bruce arrived at Aberdeen from Norway with the *Hekla*, the vessel recently purchased for the expedition. Head winds and seas and cold and squally weather were met with, but the ship effected her passage in an entirely satisfactory manner. Besides being of great strength to resist ice pressure, she is a thoroughly seaworthy vessel. A short time was spent at each of the following places:—Aberdeen, Peterhead,

Inverness, Fort-William, and Oban, and the keenest interest was in every case shown in the vessel in spite of the fact that she is as yet in no way equipped for scientific work. The *Hekla* is now at Troon, where the alterations will be carried out by the Ailsa Shipbuilding Company under the guidance of Mr. G. L. Watson, the well-known naval architect.

During his stay in Norway, Mr. Bruce placed orders for the sledges, skis, kayaks, and a certain amount of woollen clothing. Professor Nansen has kindly consented to direct and supervise the making of these important articles of equipment during the leader's absence in Scotland. Professor Nansen has expressed a wish to accompany the *Hekla* during her trial trip to the Atlantic before her final departure for the Antarctic.

Swedish Antarctic Expedition.—Dr. Gunnar Andersson arrived at Granton on the 19th of January. After conferring with Mr. W. S. Bruce regarding the work of the Swedish and Scottish Antarctic expeditions, he left Liverpool on the 24th for the Falkland Islands. He will there meet the *Antarctic*, and will take charge during Dr. Otto Nordenskjöld's absence at the wintering station in Graham's Land. His chief work will be the investigation of the geology and fauna of the Falkland Islands and Tierra del Fuego, and possibly also of South Georgia. In the spring he will return to the south with the *Antarctic*, relieve Dr. Nordenskjöld and his wintering party, and further exploration will then be made of the Graham's Land coast. In the event of there being no word of the Swedish ship, Mr. Bruce has promised that the Scottish Expedition will call at Cape Seymour to investigate the reason and give help should such be necessary.

National Antarctic Expedition.—An article in the *Times* based upon despatches received from Captain Scott and other officers of the *Discovery*, reviews the work already done by the ship, and concludes with a further appeal for the £10,000 still necessary to fit up the relief ship. After leaving the Cape on October 14th, the *Discovery* pushed southwards in order to make observations on the focus of maximum magnetic intensity, which lies at about latitude 50° S., longitude 131° E. After this the journey was continued towards the magnetic pole, and onwards to latitude 62° 50′ S., longitude 139° 40′ E., the most southerly point reached before the course was directed to North Zealand. During the southward journey the crew obtained their first experience of ice navigation. Soundings were made in depths of 2300 fathoms, and also after turning in a north-easterly direction towards New Zealand, in 1750 fathoms, while good tow-nettings were also obtained. The Macquarie Island was reached on November 22nd, when among other specimens a supply of penguins was obtained. These were served out as food by way of an experiment, and were in the majority of cases relished much more than was expected. Other correspondence describes the interest taken in the expedition at New Zealand during its sojourn there. The *Discovery* left New Zealand at Christmas time, a telegram of farewell being received by Sir Clement Markham, which was dated December 24th, from Port Chalmers, New Zealand, and was stated to be sent off on the eve of the final departure of the expedition.

Bernier's North Polar Expedition.—Captain Bernier has already obtained £20,000 of the £30,000 which he estimates his suggested expedition will cost. He intends to build a ship of about 300 tons, and to proceed from Vancouver to Behring Strait, touching at Port Clarence for supplies. From there the expedition will proceed northwards to a point 150 miles to the north-east of that at which the *Jeannette* was caught in the ice. Drifting at the same rate as the *Jeannette* did, Captain Bernier claims that he would pass within 100 to 150 miles of the Pole in

two years and a half. At this point part of the expedition would leave the vessel, and place stores of food at regular distances, preparatory to a dash for the Pole. The expedition will be absent four years.—*Times.*

GENERAL.

At a meeting of the Royal Meteorological Society held on January 15, Dr. Alexander Buchan, F.R.S., was presented with the Symons Gold Medal, in acknowledgment of his life-long services to meteorology. The Gold Medal was founded in May 1900, and Dr. Buchan is the first recipient.

According to *Nature*, Professor J. W. Gregory with a party of students has left Melbourne on an expedition to the Lake Eyre basin. The special object is the collection of fossils of the giant vertebrates which formerly inhabited the basin.

Royal Geographical Society of Antwerp.—This Society has informed us that it proposes to celebrate the 25th anniversary of its foundation by holding an Exhibition at Antwerp, to be opened in May next. It is proposed that the Exhibition should comprise a Cartographical Section, in which will be displayed ancient and modern maps, topographical and meteorological instruments, and so on; an Ethnographical Section, in which the Congo Free State will take part; a Maritime Section, in which will be exhibited models of ancient and modern ships, together with other exhibits intended to illustrate the progress of navigation. The Society invites the co-operation of all persons having in their possession objects which might fitly be displayed in any of the above sections. The organising secretary is Mr. Edw. Janssens, 12 rue des Récollets, Antwerp.

In connection with the native songs which Sir Harry Johnston, by means of the phonograph, brought before the audience at his lecture, it is of some interest to note an article in *L'Illustration* for January 18, which gives the score of the songs and chants of various primitive peoples.

Mr. Basil H. Soulsby, assistant in the Map Department, British Museum, has been elected Hon. Secretary of the Hakluyt Society, in succession to Mr. William Foster of the India Office.

COMMERCIAL GEOGRAPHY.

Reclamation of Zuiderzee.—Mr. W. H. Wheeler gives in *Nature* an interesting account of this scheme, with some notes on the changes which have occurred in the Netherlands during the historical period. The present Zuiderzee resulted from a great storm at the latter end of the thirteenth century, when the North Sea broke through the sand-banks which protected the north coast of Holland, and inundated a vast stretch of country lying behind them, burying whole villages, and, it is stated, killing some 80,000 individuals. Part of the old coast-line still remains as a chain of islands, and one of the suggestions most frequently put forward has been that of reclaiming the land by joining these islands by an embankment. The Commission of 1894 found this quite impracticable from the commercial standpoint, and have, instead, recommended that the inner portion only of the sea should be enclosed by an embankment 18 miles in length, extending from the North Holland coast, near the island of Wieringen, to the Friesland coast at Piaam. The embankment will be 18 feet above mean high water, and will be perforated by two locks and six outfall sluices, giving a total

waterway of 984 feet for the waters of the river Ysell. One of the locks will be large enough to allow for the passage of seagoing craft to and from Amsterdam. It is estimated that the embankment will cost £3,000,000, and will take nine years to complete. After it has been constructed, two large tracts of land on the west side, now covered by water, will be reclaimed, and will give an estimated acreage of 115,000 acres of land available for cultivation, apart from that required for the various works and roads. The reclamation of this land, together with such necessary outlay as that for military defence, for compensating the fishing interest, for improving harbours, and so on, will cost some £4,700,000. Both these projects were included in a Bill brought before the States-General recently, and though, owing to a change of Ministry, the Bill lapsed, it will no doubt be revived by the new Ministry. A further scheme, not included in the Bill just mentioned, is the reclamation of the eastern polders, which would result in the formation of 365,288 acres of land available for cultivation at an estimated cost of £7,800,000 odd. Apart from possible direct financial gain, the promoters believe that the carrying out of the scheme will greatly diminish the present cost of keeping up sea-banks, and of pumping, that the direct communication by road and rail between North Holland and Friesland which the great bank will afford must prove a great gain, and that there will be very important economic advantages connected with the cultivation of so extensive a tract of land.

British Central African Railway.—According to *African Commerce*, this railway will be begun at the end of the wet season, *i.e.* in May or June next. Ultimately the railway is to be continued to the shores of Lake Nyasa, but in the first place only the section from Chiromo to Blantyre will be constructed—a task which it is hoped may be completed in two years. The distance between the two places is eighty-four miles, and it is expected that thirty-nine miles will be laid down in the first year. Work is only to be carried on during the dry season, and material, etc., is to be conveyed by the Caillet mono-rail system. The estimated cost is £4000 to £5000 per mile.

Phosphates on Ocean Island.—The *North China Herald* states that Ocean Island in the Pacific, situated about 30 miles from the Equator, and 200 miles west of Nonuti, one of the Gilbert group, is noted, according to Messrs. W. Crosby and Co., agents for the Pacific Islands Company, for its rich deposit of phosphates. There is no anchorage at the island, but mooring buoys are laid down, one on the north-west side and the other in the south-west corner. Steamers make fast to either of these when loading, the phosphates being lightered off to the ship. There is deep water right up to the shore. The Pacific Islands Company have a large plant at the island, and they export the phosphates in considerable quantities to Australia and New Zealand. The company holds the exclusive rights in connection with the phosphates deposit on the island, employing a staff of 220 hands. Ocean Island has been under British protection for some time, but it was only formally annexed a few months ago.

Railway Extension in Uruguay.—According to a *Times* correspondent, the western railway system of this country was inaugurated at the end of December last. This system places Montevideo in direct communication with Mercedes, and opens up the rich western territory, which produces very fine wheat, as well as other agricultural products. The railway from Mercedes connects at San Jose with Montevideo by the Central Uruguay Railway, and also southward with Colonia and Sauce on the Plate estuary. At both of these places excellent accommodation is being provided for the export of produce and live-stock.

Mercedes contains 8000 to 10,000 inhabitants, and is a progressive little town, with good drainage, a model hospital, and well-laid-out streets. The completion of the railway is entirely due to British capital and energy.

The New Capital of Madagascar.—General Gallieni, the Governor-General, has expressed his intention of making Tamatave, on the east coast of Madagascar, the capital of the island. At present, Tananarive, in the centre of Madagascar, is the capital, but Tamatave offers superior commercial, industrial, and agricultural attractions. French chemists have discovered that the soil of the central part of the island lacks the essential elements of fertility, whereas the soil adjoining the coast is abundantly provided with potash, lime, and nitrogen. In addition to this, Tamatave, owing to its situation on the coast, will benefit greatly from its facilities of transport and means of rapid communication by sea.—MARC LANDRY in *Le Figaro*.

The Swiss Machinery Trade.—In 1900 this industry reached dimensions never before attained, the exports of machinery exceeding those of 1899, and the value being nearly double that of 1895. The greatest increase in value occurs in dynamo-electric machines, being four times that of 1895.—*Questions Diplomatiques et Coloniales.*

The Trade of Shanghai.—During 1900 the value of the imports to Shanghai from foreign countries was as follows, in million taels (3s. 1d. per tael):—United Kingdom, 39; British Colonies, 39—together, 78; Japan, 16; United States, 15; Europe (excluding Russia), 9; Russia, 3. Thus the British Empire outdistanced all its competitors united by 35 million taels. There is no foundation for the statement that British trade with China is seriously menaced, or that British manufacturers do not bring their goods energetically and successfully under the notice of the Chinese. No doubt German steamers have increased, but they only live at the expense of heavy subsidies from the German Government, which will have to increase its subsidies, or see its steamers suffer by competition with the great, old-established British companies. Shanghai bids fair to become the leading half-way house between East and West, the terminus eastward of the European lines and westward of the trans-Pacific system. The general prosperity of Shanghai has steadily increased during the last two years, whilst its population (350,000) has doubled during the last decade, and now includes 6774 foreigners, whereof 2691 are British.—*Mr. R. H. Fox's Report to the Foreign Office for the year* 1900.

Projected Russian Canal.—The Russian Government has approved of a canal from the Gulf of Finland to the White Sea, which will serve both strategic and commercial purposes.—HARRY DE WINDT in *Finland As It Is* (1901).

French Fisheries in the Mediterranean.—Writing from Marseilles on 3rd January, 1902, M. Morestel states that the fishery on that coast is in a dying condition. Four hundred fishermen at Martigues alone have abandoned their trade. He attributes the cause partly to the employment of mechanical means of fishing, partly to the use of dynamite by foreign fishermen, who thus devastate the French coast, and partly to French fish, delivered fresh, being undersold by fish packed in ice imported from Spain, the Tunisian lakes, and even the Persian Gulf. No distinction is made in the Paris fish market between the French and foreign supplies, and the French fishermen are thus beaten in their own market. M. Morestel calls upon the authorities to insist that sellers of fish shall declare the place where their fish came from. He points out that the stoppage of French

fisheries would be a serious blow to the French Navy, which is at present so much in need of men.—*Le Figaro.*

Completion of Siberian Railway.—According to a telegram sent by M. Witte to the Czar, this railway is virtually completed, the Eastern Chinese or Manchurian line between Nikolsk-Ussourisk and Kaidalova, with its southern branch to Port Arthur, being now available. This Eastern Chinese line has an extent of 960 miles, the Port Arthur branch of 653 miles, and they have been brought to their present state of virtual completion in a period of scarcely four years. According to M. Witte, another two years will see the whole work finished. In *The Great Siberian Railway*, a pamphlet sent to us from the Government Printing Office at St. Petersburg, an interesting account is given of the inception and progress of this great enterprise. The first stone was laid at Vladivostok by the present Czar in 1891, and in ten years 3800 miles of rail were laid down, in spite of the number and size of the bridges required. Since 1900, direct communication by rail and steamer has been possible between Europe and Vladivostok, on the shores of the Pacific, the journey taking about two and a half weeks. From Tcheliabinsk to Sretensk the journey is made by rail, the whole train being ferried over Lake Baikal (40 miles) in a specially constructed steamer, from Sretensk to Khabarofsk, by steamer down the rivers Skilka and Amoor, from Khabarofsk to Vladivostok by rail. When the Eastern Chinese section comes into use, and the circum-Baikal section is completed, it is expected that the journey of 5500 miles between Moscow and Port Arthur will be accomplished in ten days. High hopes are entertained in Russia as to the probable effect of the railway on Siberia. It is hoped that the natural resources of this vast territory may now be fully developed, and that there will be a large increase in the number of settlers.

Railway from Orenburg to Tashkend.—Among the many projected railways of the Transcaspian region, this should be specially mentioned. The work at the Tashkend end was begun on October 22, 1901, and at Orenburg some months earlier The object is partly military and partly commercial. When completed the railway will enable the government to transport troops from the heart of Russia to the southern frontier of Turkestan in eight days, instead of in three weeks as at present.—*La Mouvement Géographique*, xviii., 1901.

Projected Railway from Stanleyville to Lake Albert Nyanza.—In *Le Mouvement Géographique*, xviii., 1901, a description with a tracing is given of the proposed route of this railway, from details furnished by the engineer, M. Auguste Adam. The total distance in a straight line is 750 kilometres, but the chief difficulty lies in the fact that from Stanleyville to Irumu the track runs through the almost impenetrable virgin forest. The felling of the trees will be a very serious part of the undertaking. The eastern terminus is to be at Mahagi, at the northern extremity of the lake, not far from the point where the Nile leaves it to flow northwards.

NEW BOOKS.

From Cyprus to Zanzibar. By Edward Vizetelly. London: C. Arthur Pearson, Limited, 1901: Pp. xx + 480. *Price* 16*s.*

The principal events which are described in this book are the occupation of Cyprus by the British and the rise and rebellion of Arabi Pasha in Egypt. These are now practically ancient history; but, nevertheless, Mr. Vizetelly has been able to infuse fresh vitality into these old stories, and although they have often been

related before, our readers will be glad to hear about them again in the form in which they are now presented, viz., as they were observed and recorded by an enterprising and up-to-date war correspondent. To be successful as a war correspondent you must have indomitable courage, endless fertility of resource, much physical endurance, and the power of prompt decision on the one hand, while on the other you must not be over-sensitive or scrupulous as to taking an advantage when it is offered to you. You must have the power of hitting hard in a literary as well as a literal sense: and not only the will to hit hard, but a keen sense of enjoyment in doing so. Our readers will not have perused many pages of this book ere they will perceive that Mr. Vizetelly has plenty of the stuff from which a good war correspondent is made. On the other hand, the description he gives of how he and his confrères spent their time in Cairo makes us wonder how Sir Edward Malet or Lord Cromer tolerated their presence there at all, and throws a flood of light on the severe policy of Lord Kitchener with regard to special correspondents in the Soudanese campaigns. But the book is interesting, and often amusing, and affords excellent evidence of Mr. Vizetelly's skill, capacity, and perseverance in the prosecution of his profession. A violent prejudice against, indeed we might almost say, a hatred of the French, is obvious in nearly every chapter; and the author is almost as severe against the Germans, whose officials on the East Coast of Africa offered as much obstruction as they could to his expedition to meet Stanley when returning from the relief of Emin Pasha. The book is written in an easy, graphic, and vivacious style, which is no strain on the attention of the reader, and reminds him of the well-known works of another war correspondent, *i.e.* the late Mr. G. W. Steevens, to be carefully distinguished from yet another war correspondent, Mr. Thomas Stevens, whom Mr. Vizetelly outwitted under remarkable circumstances, which he describes in one of the last chapters of this book.

The Harmony of the Empire. By Nemo. Manchester: Abel Heywood and Son, 1901. Pp. xiii + 309.

It is somewhat difficult to understand why this book is called *The Harmony of the Empire.* The writer states that "the subject-matter is confined to those portions of the earth's surface actually or nominally under the control of Great Britain," but as a matter of fact throughout the work there is no treatment of India or of Australia, which certainly do belong to the Empire, while one of the six books into which it is divided treats of Egypt, which equally certainly does not as yet belong to the Empire. So far as it goes, it gives a graphic and for the most part historical account of the acquisition of our colonies, treating them not in chronological order or even in the order of their importance, but according to locality on the trade-routes. When, however, the anonymous author touches on politics, his judgment is not always to be approved. For example, this is what he says of the acquisition of Cyprus: "Its acquisition was undertaken partly to gratify the vanity of an English politician who held office at the time, and partly to furnish a hostile demonstration against Russia, which was then considered the orthodox thing to do, and partly to hoodwink the British public. . . . The island of Cyprus was contemptuously tossed to England, just as a picked bone is thrown to a snarling dog to keep it quiet."

The West Indies and the Empire. By H. de R. Walker. London: T. Fisher Unwin, 1901. Pp. x + 253. *Price 7s. 6d.*

The author of this book, who is already well known as the writer of *Australasian Democracy*, spent the winter of the years 1900-1 in travelling through our

West Indian Colonies and studying their political and economic condition. The work now before us sets forth his views on this complicated subject, but contains little if anything of interest to the geographer. It is very evident that in the opinion of Mr. Walker our West Indian colonies are in a very bad way, owing to various causes, of which the two principal are the foreign bounties on sugar, which have all but destroyed the sugar trade, which should be the staple industry of the islands, and the incapacity and apathy of the inhabitants, both white and black, who take hardly any interest in their own government. The remedies for this are, of course, the abolition of the bounties, or in default of this the imposition of countervailing duties by the Home Government, a proposal ruled out of court at once as opposed to the principles of Free-Trade, to which Great Britain is pledged, and direct government by the Crown, *i.e.* the Colonial Office, for which Mr. Walker puts forward what is at least a strong *prima facie* case. To readers who are interested in the future welfare of these colonies this book is heartily commended.

Handbook for Northamptonshire and Rutland. Second edition. With Maps. London: Edward Stanford, 1901. Pp. 256. *Price* 7*s.* 6*d.*

This is a carefully revised and partly rewritten edition of Murray's Handbook. The editor, whose name does not appear, has done his work thoroughly, and evidently devoted special care to the architectural and archæological features. There are three good topographical maps by Bartholomew. This volume is the first of Murray's Handbooks issued under the auspices of Mr. Stanford, the new publisher of the series.

Wales. ("Story of the Nations" Series.) By Owen M. Edwards. London: T. Fisher Unwin. New York: G. P. Putnam's Sons, 1901. Pp. xxiv + 421. *Price* 5*s.*

We understand that with this issue of the History of Wales the "Story of the Nations Series" comes to an end, and it is awarding no small meed of praise to the last volume to say that in literary merit and historic interest it is fully up to the average of its predecessors. The early history of Wales, *i.e.* its history before its conquest by Edward I. in 1278, and we might say even up to the Union in 1535 forced upon the Welsh by the strong hand of Thomas Cromwell, is for the most part a tangled heap of tribal wars, romantic episodes, and patriotic struggles against England, which cannot be understood without an accurate comprehension of the geography of the country. The character of the people and its literature also have unquestionably been greatly affected and modified by its configuration and climate, but whether the physical surroundings and conditions of the Welsh mountains are such as to warrant Mr. Edwards's contention that "their inhabitants will ever be a separate nation" is obviously open to doubt. The history of the mountain clans of Scotland seems to point to a different conclusion. But this Story of Wales is full of interest and instruction, and we heartily commend it to the perusal of our readers. The work is beautifully illustrated and has some useful maps.

A Geography of Wales, intended chiefly for use in Welsh Schools. By A. E. L. Hudson. London: Macmillan and Co., 1901. Pp. 164.

Intended to cover the subject required by Stage I. of the Central Welsh Board's Syllabus, this little book is a departure from old-fashioned methods of teaching geography. The author desires to interest Welsh children in the physiography, people, and progress of their own country, and successfully accomplishes his task. The book is attractively illustrated and contains several special maps of Wales, but we miss one good, clear map of Wales divided into counties. The statement

that "Cardiff, Swansea, and Newport are the only towns possessing a population of over 50,000" is rather bald, seeing that according to the census of 1901 the estimated population of Cardiff was 164,420, of Swansea 94,514, and of Newport 67,290.

Une Saison en Nouvelle-Zélande. Par GASTON DE SÉGUR. Paris: Plon, 1901. Pp. 291. *Price 4 francs.*

Written with much spirit, this volume gives the opinions regarding New Zealand, its scenery, and its people formed by the Vicomte Gaston de Ségur during a visit in 1900. He was delighted with the Colony, and declares that "the country exercises a magic charm on every visitor. To what is this charm due? Is it to the exquisite beauty of the scenery, the richness of the vegetation, the delicious climate, or the purity of the light which lends to the lakes, mountains, sunrises, and sunsets the colours of an enchanted sky? All these causes and others tend to make tourists visiting New Zealand unable to tear themselves away." There are numerous illustrations and a map.

The Nile Reservoir Dam at Assuân, and After. By W. WILLCOCKS, C.M.G., M.I.C.E., Managing Director Daira Sanieh Company, late Director-General of Reservoirs, Egypt. London: E. and F. N. Spon, Limited, 1901. Pp. 29.

"Allowing for waste of all kinds, it has been assumed that a reservoir in the latitude of Assuân, capable of supplying 200,000 millions of cubic feet of water, would amply suffice for the whole valley of the Nile down-stream of Assuân." This would increase, by £6,000,000 per annum, the rental value of Egypt. The author states that, when in the Egyptian service, he had projected a dam at Assuân and a weir at Assiout, and that in 1898 Sir Ernest Cassel came forward with the funds, and with Sir John Aird and Co. as contractors, and Sir Benjamin Baker as consulting engineer, undertook to construct in five years the works which are now proceeding as designed by the author. The designs of sections of the Assuân dam are given in this volume, the Assuân dam being a type which is new to the world, and which will, if successful, mark an epoch in dam-building. It will cost £1,750,000.

An even greater scheme is projected by the author. By means of plans and sections of the basin of the Nile, from source to sea, he shows how the Sudan itself can be irrigated from Khartoum eastwards by weirs and canals costing £7,750,000. So authoritative and well illustrated a work well deserves the attention of all interested in the progress and prosperity of Egypt.

A Letter and Two Other Papers on the Water of the Great Rivers of India as essential to the Prosperity of the Nation and the only possible means of preventing Famine. By Major-General F. C. COTTON, C.S.I. London: Rivingtons, 1901. *Price* 1s.

This pamphlet contains an eloquent appeal to engineers and others on the subject of water in India. The great rivers, the author considers, should be utilised for three purposes—for irrigation, for navigation, and as water-power. He points out that from a variety of causes canals in this country are relatively little used or appreciated, and that in consequence the British race in India has failed to realise their great importance, and is lamentably behind other nations in regard to the question of inland water-transport. If its whole value were thoroughly appreciated, then the objection on the score of expense, so often put forward in regard to irrigation works pure and simple, would lose much of its force, for the returns from the navigable canals, no less than from the utilisation of water-power, would greatly diminish the cost.

THE SCOTTISH GEOGRAPHICAL MAGAZINE.

TO THE VICTORIA NYANZA BY THE UGANDA RAILWAY.[1]

By Commander B. Whitehouse, R.N.

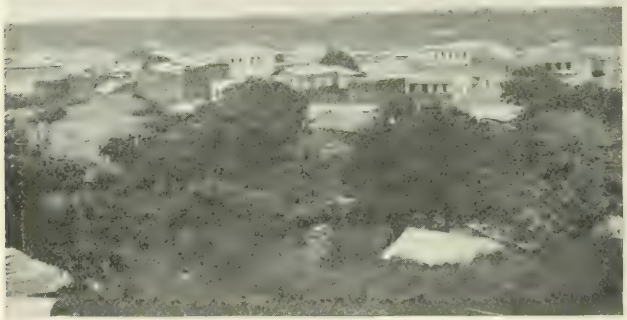
(*With Map and Illustrations.*)

The Chief Engineer of the Uganda Railway and his staff arrived at Mombasa on 11th December 1895; plate-laying began on the mainland on 5th August 1896, and the first locomotive reached the lake shores on 19th December 1901. So little has ever been said about this railway that few people have any idea of the circumstances under which it has been built.

When the first survey parties arrived, there was a great scarcity of water on Mombasa Island, condensing plant had to be telegraphed for and worked steadily without ceasing for four years. Harbour works had to be built at Kilindini. Except for caravan work and survey parties there was no local labour obtainable. Emigration under contract is not permitted by law from India to East Africa; a special Act allowed the importation of twenty thousand men from India, principally Punjabis, all of whom had to be supplied with food from their own country. While in the low country officers and men suffered greatly from fever, smallpox often appeared, the engineers' strike in England made it difficult to obtain material and locomotives. Officers had to learn the two languages in use on the line. Famine among the natives lasted for nearly two years. The line had to climb to a height of 7900 feet at mile 355 at the Kikuyu Escarpment, then descending to 6000 feet at mile 430 at Lake Elmenteita, had to again climb to 8320 feet at mile 490 on the Mau ranges, descending to the lake at a level of 3726 feet above the sea at mile 582 over a route for most of the last 100 miles that previous to September 1898 no European had ever

[1] Read before the Society of Arts, January 20th, and published in the Society's *Journal*, February 14th. The paper was also read before the Scottish Geographical Society, February 13th.

trodden. No railway has ever been built under such extraordinary conditions or caused such radical changes in the country through which it has passed. Till other railways are constructed the whole of the trade of that part of Central Africa must come to it. The way the country has been opened up by it is very marked; rupees are in constant use where previously only beads, cloth, and wire were asked for. The journey from Mombasa to Port Florence, on the opening of the whole line, will take two and a half days, and allowing another day for the steamer journey of 148 miles to Mengo, the capital of Uganda, we have a total of three and a half days, instead of about seventy by the old caravan route. All the privations, delays, and trouble of the caravan road are things of the past, and travellers now pass through the country in a first-class sleeping carriage at a charge of threepence per mile, with rates for their goods that compare most favourably with



An overhead view of Mombasa. (From *The Sphere*.)

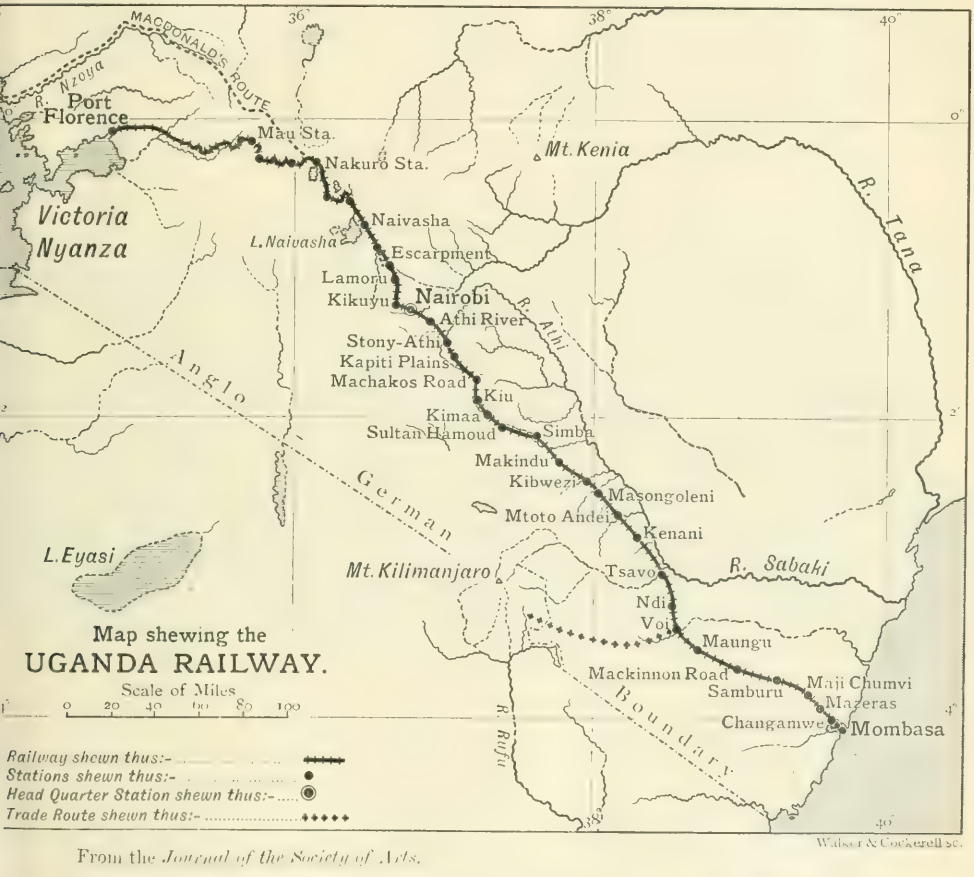
some of the other railways in Africa. Cable messages can be sent from any station on the railway, and a telegraph line has been laid into Uganda from Port Florence by the Railway Telegraph Staff.

The line of the railway is laid along the shortest route from the port of Mombasa to the most eastern point of the lake (see map[1]). It is also on the shortest route to the first proposed terminus at Port Victoria. Between Port Florence and Port Victoria there are no great obstacles in the way of further extensions except the Nzoia River, which would have to be bridged in any case. When Port Florence was first visited by the railway survey parties in 1898 the Kavirondo tribes on each side of it were having constant fights on a small scale. The only intercourse was carried on by women, who did all the trading. The tribe inhabiting the Nandi plateau, about 2300 feet above the lake, occasionally descended on the Kavirondo people, cleared up a village or two, and drove off as many cattle as possible. On one occasion the surveyors, wishing to make arrangements through the Protectorate

[1] This map should be compared with that which appeared in the *Magazine*, October 1901.

officers for buying up a village that the centre line cut through, afterwards found that the Wanandi had saved them the trouble, the village having disappeared in the interval. Hill tribes here, as usual all over the world, are more warlike than those in the plain, but now they are all beginning to understand that they must behave better.

Beyond the great additions to our knowledge of the country which have arisen from the actual surveys for the line, the whole of the



From the *Journal of the Society of Arts*.

coast-line of the British half of the Victoria Nyanza, with all the islands that are known to exist in it, has also been surveyed, under the superintendence of the chief engineer of the railway. This work was found to be necessary owing to the discovery in 1898 from the railway surveys, that the east side of the Lake differed very much from what it was supposed to be.

In Sir Henry Stanley's memorable journey of 1875, he visited a bay which he called "Ugowe Bay," and which was looked on as the most eastern point of the Lake. Sir Henry had, of course, very few opportunities compared to those enjoyed by the surveyors sent out

by the railway. After our survey, specially equipped for the purpose, I can gladly testify to the fact that his journey round the Lake in a small boat, with a few men and no force at his disposal, was a most venturesome piece of exploration, and not the least part of an altogether remarkable journey. The narrow and land-locked entrance of the great gulf of Kavirondo was evidently passed by him without being noticed, a thing remarkably easy to do when travelling in a small boat as he was. Later, the name "Ugowe" was wrongly given to the gulf at the head of which the railway terminus now is, and the Government station on the west side of Port Florence was called Port Ugowe; this caused a good deal of mystification.

In June 1898 a large caravan was despatched from Kilindini by the chief engineer, for the special purpose of exploring the route between Lake Nakuro and Port Florence, or, as it was then called, Ugowe Bay. This expedition was given the most precise instructions as to the direction in which the new route was to be attempted.

No information concerning this route was available anywhere except from the maps of Colonel Macdonald's Surveys, and of the late Colonel Vandeleur, Scots Guards, whose map of Nandi we had with us. Captain Smith, R.E., had looked from distant hills over some of the valleys we traversed, but his map was not ready, and when we crossed that part of the country the latest maps showed it a blank. During the reconnaissance, the weather was very wet and all the rivers were difficult to cross. The expedition marched to Nandi and down to the head of the so-called Ugowe Bay, from which it marched on September 1st across the Kavirondo Plain and into the hills, arriving on the summit of Mau on September 13th. The only people we had any communication with during the march were some Wanandi, on entering the hilly country, and it was not possible to get many names of places. For several days we had marched towards a dark wooded hill close to the summit, which on being passed was named Mount Blackett, after the leader of the expedition. Descending to the plains, the caravan broke up on September 15th. The military police and all useless men were sent down country. Mr. Blackett and Dr. Brock, the medical officer with the expedition, proceeded over the old survey route to compare it with the one just discovered, while eighty-three men went with me as fast as we could up the road to Nandi, where the steel boat already left there was picked up and taken on to Port Victoria. I met Mr. C. W. Hobley on reaching Mumias, and he then very kindly gave me a copy of his map published by the Royal Geographical Society in October 1898. He had discovered that the coast between Port Victoria and Port Florence differed from what it was thought to be, but unfortunately he missed Ugowe Bay, and the Kavirondo Gulf was still shown as a large, open bay, and still called Ugowe; what he thought were islands was really the mainland of Kasagunga and Kisingere—a very easy error to make from the other side of the gulf, especially if the weather was at all misty. Directly the chief engineer heard the reconnaissance had succeeded, he came up country as fast as possible with Mr. J. R. Baass, Superintendent of Surveys, and Mrs. Whitehouse accompanied the party.

The three parties met at Port Victoria on October 23rd, 1898, just as the steel boat *Vice-Admiral* was ready for work. Port Victoria was examined in case the terminus should have to be built there, then the chief engineer went round in the *Vice-Admiral*, examining and mapping the coast all the way to the present terminus, the rest of the parties marched overland, and we all met at Port Florence on October 31st, 1898. The caravans went on to Kitoto's to buy food for the march over the new route, while the boat party visited Nyakach to examine Kach Bay; on landing, not knowing we were so close to the Miriu River (which I understand from Captain Gorges, Uganda Rifles, is the one he came down later in 1899 from Naivasha, and which the Walumbwas call the "Sondo"), we climbed the nearest hill to see what the coast-line looked like. On our way we heard the rush of water, and found the Miriu River in high flood; the people were greatly surprised to see us, but were

Port Florence, the railway terminus on Lake Victoria Nyanza. (From *The Sphere*.)

very amiable. We returned to Port Florence, and on November 3rd, 1898, the chief engineer marched to Kitoto's and proceeded with the other parties over the new route. Survey parties were despatched to it directly after his return to headquarters, and trains are now running along it.

After the survey of the future port was completed, the *Vice-Admiral* was taken back to Port Victoria. From the hills near the Miriu River we had seen there was apparently a continuous coast-line right up to Homa.

I should say here that on my return to headquarters I found a copy of Mr. Gedge's map giving Mr. Jackson's route to Uganda in 1890, and this showed Homa as a point of the mainland. As I wished to be quite sure, the boat instead of returning along the north shore was taken south from Ndere Island towards two very conspicuous trees on the opposite shore. That night we camped at Homa Point, the people being quite friendly. Next day the boat crossed Homa Bay to Soklo, in Usau, and as the coast-line was getting most interesting, it was decided to stop there,

so that a good view could be got from the summit of an adjacent hill. Most fortunately a man called Katizai was found here, who had once been in a caravan to the coast and knew a little Swahili. He was rather old, but managed to get to the top of Sahanga Hill next morning, over a thousand feet above the lake; then it was found that instead of being an open bay with a mouth twenty miles across, we were in a land-locked gulf forty miles long, and that the so-called islands were mainland with hills towering over 3000 feet above the lake. Close behind were the Ruri Hills, afterwards visited and found to be about 1800 feet above the lake. North was the Kakanaga Range with Gembe Peak, afterwards visited and found to be 2488 feet above lake-level. West of that was the Gwasi mountain, afterwards one of the main points of the Lake Survey, and found to be 3370 feet above the lake and the highest hill on the British shore. East was Homa Mountain, its northern conical peak over 1700 feet. Hundreds of villages were in sight, and to the south countless bush fires showed the presence of natives in great numbers. At the head of Homa Bay were two conical hills, called Simenya and Asago, afterwards visited and Ugemi, the district they were in, found to be an exceedingly fine one. Inside Homa Bay was Ruri Bay, and at the head of it and below us sprinkled all over Usa, were many curious little conical hills from 200 to 700 feet high. Nearly forty miles to the north-east was Port Florence, with the steep Nandi Escarpment behind it. North was the entrance to the gulf, almost shut in by a very curious-looking island, Rusinga; beyond that again was the conical hill "Serawongo," 470 feet, noticed by Sir Henry Stanley in his voyage, and afterwards an important trigonometrical station in the survey. Farther north were the hills of Inyala, over the Government station of Port Victoria, with the Samia Hills to the right of them, while to the left lay many islands. Katizai, the old traveller, pointed out his chief's village, and then gave us the names of all the districts and their chiefs; after checking them at dozens of other places, more than a year later, he was found to have made only one mistake. Passing on up the coast, the mouth of the gulf was crossed, and the second entrance to it, Mbita Passage, only 280 yards broad, and afterwards a favourite camp, was sketched in. As we were travelling with orders to return with the greatest despatch, Ugowe was not then found, but a bay as we passed was seen to be much larger than when sketched in during misty weather on our trip down, and noted for special examination later. We marched from Port Victoria across country to Port Florence and Kitoto's. Lake Gangu was reached on the first day, and we camped by a curious heap of rocks just east of it called Ndere. Meeting Ugada, chief of Usakwa, at his village, I offered to take his son Obamba to the coast; as he spoke Swahili very well, he was most useful everywhere, and was certainly the smartest native I met in Africa. On arrival at Kitoto's there were too many sick men in the caravan to attempt the rivers and hills of the new route, so the loads were sent up to the caravan road at Nandi and food was bought for the journey down at Rongo villages on the Umbe River, a little east of Kitoto's kraal. The people became very friendly, and as it was Christmas time we organised the first athletic

meeting ever held in Kavirondo. A big store was afterwards built by the railway just across the river, and food supplied to our survey parties for many months. Kitoto, said to be once the head chief of Kavirondo, is an avaricious old fellow, with very little authority over his people ; in fact, on all the lake coast of Kavirondo the chiefs have little power, every man seems to do what is right in his own eyes. Finding a better road up to Nandi than we came down, we marched up there, and so down to railhead, then at Kimaa, mile 264.

The Lake survey was commenced at the end of 1899, and it cleared up all geographical questions concerning the coast-line in British territory. The survey was carried out in thirteen months, during which about 2200 miles of coast-line was mapped. Life at the Lake was then very different from what it had been. Survey parties were close to, the telegraph wire was at Port Florence and was being laid into Uganda headquarters ; a big caravan under Mr. Barton-Wright, assistant-engineer, was carrying up the three thousand loads of the steamship *William Mackinnon*, and engineers were building her. We went by train to the Kikuyu Escarpment, and by mule cart to Mole, being taken on by porters from Mole over the new route. If anything was wanted it could be telegraphed for, and when we returned to our head camp we generally found mails waiting for us. A great amount of information was obtained about the new country south of Kavirondo Gulf ; a warlike tribe, the "Kisi," inhabiting that part of the map marked Kosova, was heard of by that name for the first time. All round the coast, from Nyakach to Kadem, natives pointed to the same direction, and spoke of this tribe as they do of the Wanandi. Gembe and other hills near it, over 2000 feet, were ascended, and also several more in Utegi, Karungu, and Kadem. Cairns were left on most of them, as well as on Pyramid Island in the Ugingo group of islets.

I had never been able to find any one who knew "Ugowe," though asking for it on every possible occasion. Kioto himself said there was no such place anywhere near him ; Obamba, when passing Lake Gangu on our way from Port Victoria, pointed over to the west, and said, "That is Uhandas." Most unfortunately he was not asked the usual question : "Is that the chief's name or the name of the district?" This should always be done, as names of chiefs are often given to districts by mistake. It was seen by this time that Ugowe could not be at Port Florence. When going north to Port Victoria, I sent for some Usakwa people at Uyawe, and with my interpreter and the head man of Uyawe, named Akeni, who spoke Swahili very well, asked them where the mouth of the Yala was ; they said farther up the coast. Then they were asked, "What is the name of the place where the water of the Yala passes into the lake?" They all said "Ugowe." We went on next day to the biggest bay in Kadimu, and camped on its south shore. In the evening Utonga Hill was climbed to get a view. Natives from it pointed out the district boundaries of Usakwa and Kadimu. The district Kadimu must be Sir H. Stanley's Nakadimu. Next day we went to see the Yala River. Natives said it was two hours' march ; it turned out to be three hours and a half hard walking. We covered there and back, a distance of

twenty-two miles. Passing the head of the gulf, all the natives said there was no river there, as shown on the old map. It was thought they must be wrong, but they insisted and said the river mouth was farther up at Ugowe. To show we really had been to the river, it was photographed up stream and down. As we were leaving, a man came up and I asked him for some of the names of the villages round; he spoke Swahili, and said, "I remember you; you are the master of Obamba, and I am his friend. My name is Uyo, and I saw you often at Inyala with Mr. Foaker." It was very nice to meet an acquaintance in such a place. Next day we camped inside Usangi Hill at a place called Nangera. Mr. Hunter's report that there was no river at the head of the big bay was very puzzling, but natives said the river was just round the other side of Usangi Hill at Ugowe. The interpreter and some people from the villages were taken up the hill in the evening. On getting close to the top we were astonished to see a big lake below us. "This is Ugowe," said the interpreter, "the Yala River comes round that hill; there are the villages of the Ugowe chief, and there is the water of the Yala, passing to the Lake." The people with us confirmed all this. As usual, to show there was no mistake about our having been there, the camera was put up, and photographs taken all round the compass. Next day we went to Ugowe, and landed by the mouth of the river, which was full of fish-traps. The chief came to see us and said he knew me. This was surprising, but he explained, through the interpreter, not having much Swahili himself, that he had seen me "building a dhow" with Mr. Foaker, a Protectorate officer at Inyala, Port Victoria. We asked his name; he replied, "Uhanda." He said he knew Obamba, and that he had gone with me to my country. On asking the name of the place, he said, "Ugowe." Asked if it was all Ugowe, he replied, "No, only just here, this is all Kadimu"; and every name we had heard was verified over again. We told him we were very pleased to meet him indeed; that we had been chasing him and his country for the last two years, and now having found him intended to hand him down to posterity. The camera did the rest. We arranged with him to pass the *Vice-Admiral* through the fish-traps in the river next day, and she was taken round Ugowe Lake. Then thinking we could see the Yala River from the top of Ramogi Hill we went up there, and found there was another lake on the east side of it, called Ramboyu. Hearing the Yala River did not run into that, we went round Ramboyu Lake determined to find out where the end of the river was. After a long walk over the hills to a place called Ndiwo, we saw where the river ran into the swamp. Ramboyu, Ugowe, and Gangu appear to be open places in the same swamp.

On reaching Port Victoria I sent for Namoja, the chief of Inyala, and the chief Govedo, otherwise known as Fisi, who lived close to the old Government station, and asked them if they knew where Ugowe was. A crowd of people came with them, and many of them spoke Swahili. They chattered together, mentioning the name of the last officer at Port Victoria; then one man asked if I meant the place the white men had gone away to. The question was repeated, and they all said they did not know any place called that. Then I asked if they knew the name

Cutting on the Uganda Railway. Mile 346.

of the place the white men had gone away to, and none of them did. Then if they knew a man called Uhanda, and they all did. Where did he live? "In Kadimu." What was the name of his village? "Ugowe." Then they were asked why they were such foolish people as to say their friend lived at Ugowe, in Kadimu, after they had just said they did not know where Ugowe was. The chief said, in an injured tone, "That place is close to, we thought you were talking of some place far away." As usual, to make sure, I went up a hill near the old Government station, and took a photograph of Ugowe Bay in the distance, as well as the panorama of all the coast north and south. As there still seemed to be doubt in some minds that we had found the place visited by Sir H. Stanley, on our way back to Port Florence at the end of the survey we visited two small islets north of Rusinga Island. We had never found Sir H. Stanley's "Bridge Island," from which he proceeded northward to Ugowe Bay. If a natural bridge could be found at these islets I knew it would of course settle the question for good, as to get to Port Florence he would have had to go south-east instead of northwards. We had a good breeze out to the islets from Uyawe, and to show that there was no doubt about our having been there, a photograph of south Bridge Island was taken, which shows that there are hardly any trees left on it. The islet is forty to fifty feet high, and was covered with birds' nests, mostly cormorants; on examination the cave reported on the other islet was also found to be an arch. There are a great many natural arches on the Lake; one smaller one quite close to Entebbe.

The weather on the Lake is often very misty, which stops triangulation a good deal, but when clear, objects can be seen at very great distances.

From Gembe Peak, 2488 feet above lake-level, angles were taken to the big tree at Bagete on Buvuma Island, which was plainly seen with the theodolite telescope at seventy-eight statute miles distance. This tree was afterwards visited. Precautions were taken on landing in Buvuma, as the natives have a bad character. A crowd of from four hundred to five hundred soon gathered, and many more were seen streaming in from all directions over the hills. These interesting people looked very truculent, and their well-known expertness with slings and stones is visibly stamped on the heads of many of them. Of the nearest fifteen, no less than twelve had their heads battered in, the scar generally taking the shape of a large Maltese cross. An old stone fort was found on the top of Ndwasi Hill in Bugaia Island, which had evidently been built as a place of retreat from the Wavuma. Other defences were seen on many other islands, but this was the largest, and having many storehouses in it, was quite capable of standing a siege if put into order. The chief of Bugaia said it was a very old fort.

To go back to the railway, as already said, the want of water was very serious during construction up to Voi; it is different now, as water is pumped up from the Mwachi River, some distance from the line to Mazeras Station, mile 16. A pool of water was found by the surveyors above Maji Chumvi Bridges, formed by a natural ledge of rock lying across the bed of the stream; it was very brackish, but better than nothing. There was no more water till the Taru Desert was crossed, but

a small pool sometimes existed on the top of a rocky hill at Maungu, mile 83. There was another pool on a higher hill some distance to the south. Soon after the line reached Voi River, which according to all accounts never ran dry, it got perfectly dry, but water was obtained from the swamp above the bridge, one mile beyond the station. The C.M.S. have a station on the Sagalla Hills, called by caravan porters the Ndara Hills. The next water used was that of the Tsavo River, mile 133. This river runs in a great hurry, and joining the Athi River below the bridge, forms the Sabaki River, which runs into the sea a little north of Mombasa. It was at Tsavo that two lions created such a panic by carrying off twenty-eight coolies, the number of Africans killed not being ascertainable. The line from here is very uninteresting. If passed during the day, the snow-capped mountain Kilimanjaro is often seen to the south. Several small streams which occasionally run dry are crossed, but at Kibwezi, mile 195, there is a pretty little river running through an artificial bed made by the Scottish Mission, which has now moved its quarters to the Kikuyu Hills. After leaving Kibwezi, the grey thorny bush becomes more open. Game of all descriptions is constantly seen close to the line. From the Tsavo River to the Kedong River, except within a ten miles circle from Kikuyu Fort (an old Government station, now given up) the railway runs through the Game Reserve of East Africa. Beasts of prey can be shot on the railway limit (that is, a mile each side of it), and a reward is paid for every lion shot between certain stations. This reward of one hundred rupees is given, as lions have caused much trouble on the line—the worst case being that of Mr. Ryall, the Acting Superintendent of Police of the railway. A lion had become a confirmed man-eater at Kimaa, mile 257. Mr. Ryall, travelling with two other gentlemen, had his inspection carriage cut off at Kimaa, on purpose to try and shoot it. As the story has already been told, and is a very dreadful one, it will be enough to say that the lion got into the carriage in the night, killed Mr. Ryall without taking any notice of the other two gentlemen; and the door shutting (the slightest push would be sufficient to close it), it carried off Mr. Ryall through one of the windows. One hundred pounds reward was at once offered for the man-eater, and a lion was afterwards caught in a trap by Mr. Costello, of Makindu Locomotive Staff. As further trouble ceased with this capture, the reward was paid for it. Passing travellers have thought on some occasions that all the game had disappeared from the Athai Plains. My experiences are quite different. For the last five days I was at Nairobi I went out to shoot a little meat for some of the men who had been up at the Lake with me. Coming over the plains in the train from Nairobi we saw a vast number of Thompson's gazelle, several herds of harte-beest, about twenty ostriches, dozens of bustard, and a good many wilde-beest; a cow giraffe and her calf were on the Athi River just below the bridge. I was told that two days before I got there five lions had crossed the line at the down points of Athi River Station early one morning. The men in charge of the pump by the river told me a lioness and two cubs had crossed the down end of the bridge the night before. Within five miles of the station I shot what I

wanted without trouble, seeing wilde-beest, harte-beest, Grant's, Thompson's gazelle, and Impala in great numbers, as well as five hyenas and several ostriches. Plenty of lions were heard every night, while close to where I was were herds of some thousands of zebra. I also got twenty-five sand grouse, five spur fowl, and three bustard ; there are plenty of fish in the river, very like Mahseer, and they give good sport with light tackle and a gold and silver spoon. The morning I went back to Athi River Station, a lioness was shot near it by a visitor from England. Considering this place was at the edge of the reserve, and within very easy reach of Nairobi, game has evidently not quite disappeared. The game laws are now very strict; a game licence for a Government officer costs £10 a year; the number of animals allowed to be shot are limited. Settlers, traders, and missionaries also £10 a year for still more limited numbers. Visitors who come to shoot have to pay £50 for a limited number of beasts in each Protectorate. Many species are protected altogether, and there are many restrictions that intending sportsmen should make themselves familiar with before going there.

There are a large number of rhinoceri in places along the line. As a rule they do not interfere with travellers that let them alone. In some cases, of course, they are dangerous, but it was easy to get close to many for photographs. It is often said that a rhinoceros will charge the person that he gets the wind of; such is not my experience. I walked close up to the first I saw by accident—a cow and its calf. They certainly got my wind at a distance of less than twenty yards, but after looking at me for a few seconds they both bolted. On another occasion, on the Athi Plains, one came up towards us, and, stopping less than two hundred yards away, watched the caravan go by, with the wind blowing straight from us to him. Probably he was used to seeing Masai and other natives, and rhinoceri in less frequented places might have been more dangerous. Two are allowed to be shot by licence. It is very poor sport shooting them, but, like the hippopotamus, they are a cheap present to gain the natives' good-will in famine time. One shot at Kin was entirely eaten that day, and the next morning we found some poor starved creatures picking off what flesh was left on the head, and eating it raw. The famine along the line in 1898-99 was very bad, and it is hardly surprising that the starving people should have tried on some few occasions to get at the flour stores of the permanent way gangs. It must be dreadful to see a line of camps with plenty of food stretching along a famine-stricken country, and not to be able to share any of it.

Masai Natives, showing the characteristic ornaments. (From *The Sphere*.)

On the Londian River.

There are many different tribes along the line. The most useful people at present in Africa are the Swahilis, the Seedie boys of the men-of-war and the mail steamer. Most of them are Mohammedans; but they are not very particular over their religion. Porters are drawn from many tribes, from Uganda right down to the coast. If they are kept any time inactive they get very lazy, and have to be hunted round before they will go to work again. The Swahilis are very good men for caravan and survey work. Great things were prophesied as to what the Masai would do to the railway when it reached their country; but they turned out to be the most amiable of all the tribes. Some few are herdsmen to people connected with the line, and some of the boys become servants for a time, but I have never heard of any working on the line, and such work would be very much against their ordinary habits. They have not very good physique as a rule, and are far below the Zulu in that respect; those round Naivasha were the finest met with. The so-called Masai that were employed in guarding the telegraph wires in the Nyando Valley when we marched down on our return from the Lake, were the weediest-looking natives I have ever seen in any part of the world, but it was said they were not real Masai. The kraals visited never gave any inducement to visit them a second time. The Wanandi are a very warlike race; the finest young man I ever saw in Africa was in Nandi; he passed us carrying his shield and spears, walking as if he owned the country and knew it. The Wakavirondo are dreadful cowards, with very few exceptions (such as Obamba). At any sudden movement they will scatter like a flock of sheep.

The climate of the district the line passes through is pleasant, from Sultan Hamoud Station, mile 238, to the lower part of the Nyando Valley, mile 550. From above mile 33, bad nights such as have to be endured on the tropical coasts of Africa and India are never experienced.

Coffee grows well in Sesse and Uganda, and rubber grows everywhere. Hardly any island was visited west of Buvuma, that had not Landolphia rubber vines growing on it. Very good fibre is grown in East Africa and Uganda. Castor-oil plant grows everywhere, and, if trees of it are allowed in gardens, they become a nuisance, as they spread so very quickly. Tobacco grows well, especially in Nandi, and is much used by all the people. Good crops of potatoes and all kinds of English vegetables can be easily raised round Nairobi. Uganda itself and Budda appear to be very good agricultural countries, and

Mombasa—the old Portugese Fort. (From *The Sphere.*)

Nandi certainly looks like a very fine planting country. Kikuyu will, of course, become settled in before Nandi, as Nairobi is the most important place in the country next to Mombasa. Its population is roughly about 5000. There was no one there till the railway made its appearance, the headquarters of the Ukamba province being then at Machakos, some distance to the south-east. Very good gardens can be made on the Kikuyu hills, and it is easy to irrigate them. Most of the potatoes used on the coast and Zanzibar are said to come from France. There is no reason why they should not all be grown in Kikuyu, one day by rail from Mombasa.

Being right on the Equator, the sun is, of course, very powerful. The best results seen on the Lake were obtained in a shaded garden. The produce was quite up to the ordinary English standard, and this although the soil of that particular garden was certainly the poorest met with. A week's dry weather under such a tropical sun will do more damage than a month's dry weather in England. Irrigation from the east side of Mau ranges to the Kavirondo Plains would not be difficult; there are many streams, and Mau being the highest part of the country they are rarely dry, owing to the heavy rainfall and mists. There is enormous motive power running to waste at the Ripon Falls and the river below it, which consists of rapids and cataracts for a considerable distance down. There are also several rivers along the railway route, which could be utilised in the same way.

Apparently there is no difficulty in getting cheap labour in Uganda by people who intend to stay among the natives for some time. The Wakikuyu are beginning to understand work—many of them are now used for breaking up ground and clearing forests. The ballasting of the line near Nairobi and all the drainage of the railway township has been done with native labour. No labour was obtainable at first, as the people knew nothing about it, but it seems there will be a good deal available in the future. The occupation of the porter having gone, he will soon be forced to labour for a living, and no doubt a considerable number will eventually take to work on the line. For further railway extension there should be a good deal of local labour procurable. Waganda would certainly work well in their own country on earthworks.

There is a good deal of fever, which is not surprising in a new tropical country in which before the advent of the railway living could hardly be called comfortable. The worst kind, known as Blackwater fever, the engineers have been singularly free from, for from among about fifty employed on the line for the last five and a half years, there has been only one slight case, and yet they have been engaged in what is always supposed to be the worst thing for health in the tropics, namely, turning up virgin soil. White people appear to be generally safe from the smallpox the tribes occasionally suffer from. European children can live a pleasant life at Nairobi, and Mombasa itself is said to have a pleasanter climate than Bombay; knowing both well, Mombasa seems to me to be the cooler.

The Lake region is a very stormy one, and a day never passes

without thunder, while a storm can always be seen somewhere, although they never last long. During the first survey of Port Florence, in 1898, there were seventeen violent storms during the twenty-one days; tents were constantly blown down; this causes a lot of sickness which will not be met with when proper houses are built.

The ideas of the Lake fishermen are very primitive; no nets were ever seen, fences of reed and grass are made on the shore and at the mouths of all rivers, with traps at close intervals along them; these are visited at least twice a day; fish-pots are also much used, and drift about in all directions, often several miles from the shore, and canoes visit them constantly. Very large screens of light reed work, made on the principle of the seine-net, and laid out with rafts are used with considerable success. A row of fish-pots takes the place of the purse. In Kavirondo they were never hauled right up on the beach as our

The Fish Market at Mombasa Harbour. (From *The Sphere.*)

seines are; the screen is brought very close in, and then men and women scoop about inside it, catching the fish in their baskets, and driving them to the centre part of the screen into the baskets fixed there. It is curious to see natives wading about with hippopotami not far from them. In Uganda, Sesse, and Buddu a still more primitive screen of banana leaves is used exactly as a seine is. The ropes are well made of grass, and float on the surface; many were seen over a quarter of a mile long. The screen is sometimes laid out and allowed to drift a long distance before it is finally hauled ashore. Dried fish is a great article of trade all round the Lake, but the trade is not likely to extend beyond its shores.

A curious point about the Lake natives is, that although they have fairly good canoes, they appear to be absolutely ignorant of sails. Only one mast was ever seen, and that was evidently an imitation of our boats, which always travelled with the masts up, and no sail was used on it.

Very curious swarms of insects can be seen on the Lake; they

appear to hatch out of the water far out in the Lake, and come ashore before the southerly winds. The insects are rather less visible than the ordinary grey mosquito. Swarms were seen more than twenty-five miles distant, like the smoke of ocean steamers; at first they were taken for smoke from low islands out of sight, as they were seen on several occasions about the same spot; next they were mistaken for water-spouts, which are often seen on the Lake. A series of photographs of them were taken, but not very successfully. On the outer islands these insects are a great nuisance. The air is quite darkened with them as they drift past. The natives catch them by waving baskets round their heads, then collecting them from the bottom, they pound them up into a kind of rissole, and after exposing them to the sun for some time, eat them. We also on several occasions suffered from great swarms of what appeared to be the common May fly, particularly on one occasion at Luambu, the western island of the Sesse group, where they stopped theodolite work for some time. Mosquitoes were, of course, very bad in swampy places, but 1900 was better than 1898; the Lake in 1900 was at an extraordinary low level, and the shores, in consequence, were much drier, with fewer mosquitoes. The waters of the Lake at Port Florence have been referred to as stagnant; they are, of course, at rest, and more or less stagnant everywhere, except just at the mouths of rivers and narrow passages where the action of the wind causes currents, and at the Ripon Falls. At Port Florence the water is made worse by the hippopotami, and the fishermen that are constantly stirring up the mud. In 1898 twenty-five hippos together were often seen close to the boat at the mouth of the bay. It is a mistake to consider Port Florence any worse than many other places round the Lake. There are excellent building sites on the hills on the east side of the harbour. Kavirondo Gulf, with its narrow entrance, is naturally muddy on account of the rivers that run upon it—one of which, the Ulambwi, was only discovered during the late survey. All the water of the Lake near the shores is more or less muddy; it is quite muddy all along the west shore and between the Sesse group and Uganda. The head of Berkeley Bay is just as muddy as Port Florence.

On Mr. E. G. Ravenstein's map giving part of Sir Henry Stanley's route we found marked "Marija Islands reported by Stanley three miles east of Kiuwa not to be identified." They were identified at once from the mainland the first time they were seen—a chief was asked the name of some small islands, and he said Marida or Marija; they were afterwards visited and found to be four in number, and to be just where Sir Henry Stanley put them, viz., three miles east of Kiuwa Island.

The Kagera had apparently more water in it than the other rivers we visited, but it winds very much, and it will probably not be much used. The *Vice-Admiral* was taken about three miles up it. A steam launch, now wrecked, that belonged to an English firm, has been a considerable distance up it. No steam launch could go up any of the other rivers we saw.

The language of the country in the future will certainly be Swahili. The natives round the east coast are picking it up very quickly. We

found many speaking it at Mbitu Passage on our way back to head-quarters, but none could speak a word of it when they were first visited. Swahili is the most useful language in the country, and it seems to be a very good thing that its use is extending so fast, as the number of languages in use at present causes much confusion to travellers.

A JOURNEY FROM QUETTA TO MASHHAD BY THE NEW NUSHKI-SISTAN TRADE-ROUTE.[1]

By the Right Hon. The Earl of Ronaldshay.

With a view to travelling along the recently opened trade-route between India and Persia, across Baluchistan, I journeyed to Quetta at the end of October 1900, reaching that place on the 1st November. Here I spent ten days making final preparations, and engaged the servants I required to accompany me as far as Mashhad. These consisted of seven Indian servants and a daffidar and three sowars of the local levy from Nushki, to act as escort. By the 9th everything was ready, and I started off my caravan of baggage camels in charge of the servants and sowars, keeping behind with me the Baluchi daffidar Ralmat Khan and two of my Indian servants with our ponies and riding camels. This to give the caravan a day's start and to enable us to get through a long march on the morrow.

A curious white mist hung over Quetta on the morning of the 10th, hiding it from view as I cantered along the road accompanied by Ralmat Khan and the servants on their camels. After leaving the main road a few miles from the town, we made our way by a camel track over flat stretches of sand and gravel, covered for the most part with brown tufts of aromatic wormwood, with ridges of barren hills running parallel on either side. Here and there we passed small villages, mere clumps of low, flat-roofed mud huts, whose existence must inevitably come to an untimely end should the country ever be visited by anything like prolonged rain; miserable evidence of human existence, low and squat-looking, with no apparent aperture beyond an ill-shaped hole, presumably the door.

In parts the track was very stony, and anything beyond a walk out of the question; but at others sand took the place of stone, and we were able to go along at a canter. At sixteen miles we passed the levy post of Girdi Talab, and another sixteen brought us to Kanak, where I found my camp and spent the night.

Kanak is a levy post such as exist, or are in process of construction, at intervals of from fifteen to fifty miles, the whole way from Quetta to Sistan. They consist of mud forts known as "thanas," built square and with an erection in one or more of the angles in the form

[1] A paper read before the Society on February 6th. See map illustrating next article.

of a tower. In these thanas live a daffidar and a few sowars raised locally, who, mounted sometimes on ponies, sometimes on camels, carry the mail-bag from thana to thana, thus maintaining the only communication that exists between Sistan and the nearest British post of any account—Quetta; a distance of something like 500 miles over the deserted wastes of Baluchistan.

I left Kanak at 9 A.M., having sent my advance camp on during the night, and rode over the same sandy and stony plateau, with its covering of wormwood, crossing a low ridge of hills, after going a few miles, by a pass known as the Barak, and then on over level ground again till I reached camp pitched by a small partially deserted village, Girdi Gab. The village was the same miserable affair as all the others I had passed on the road, a huddled-up collection of low mud huts, which in this case were rapidly falling into decay; the headman, who had been given some money by the Government a year before, with a view to the improvement of his village, having promptly decamped and bolted into Afghanistan, money and all, where he had remained under the protection of the Amir ever since.

At 9 A.M. on the 12th I started for Kishingi, our next halt. The road was still, as it had been the whole way since leaving the high-road about six miles from Quetta, a mere camel-track. At one place, a pass among some low hills, we came across a small pool of water and had lunch, after which we cantered on again till we reached camp at Kishingi, about twenty-four miles. There was no village here, but a small mud fort in process of building.

On the 13th we started as usual about 9 o'clock, and after covering some miles, reached the edge of the plateau along which the track had run since leaving Quetta. From here our path descended somewhat abruptly through a labyrinth of small hills and knolls, among which it wound till it debouched on to the plain on which Nushki stands. I inquired the name of the defile by which we had descended; but all that I could make out from my followers was that it was "khand," which is merely the "Pushtu" word for a pass, so I conclude that it has no name.

On reaching the plain we were met by a party of about twenty men in many-coloured garments and mounted on gaily caparisoned steeds, with wonderful saddle-cloths of gorgeous design and colour—the aristocracy of the Nushki district.

A little farther on we came in sight of Nushki itself. It appeared to be little more than a glorified edition of all the other villages we had seen; the same one-storey mud houses, though with something more like method displayed in the ground-plan of the place. A broad street led through the centre, faced at the far end by a large rectangular building, also of mud, which contained the police lines, the levy lines, and the post-office. A short way from the main street, and clear of the town, stands a hospital, and beyond this again a caravanserai for the use of "kafilahs" or caravans; these with about 120 shops go to make the town of Nushki, which all told probably consists of about 200 houses. The population is at present hardly in proportion to the size of the town, as

I was informed that it was only about 250 people; but the place is young, the land having been but lately acquired by Government; and considering that three or four years ago there was nothing, the progress made must be considered fair. Along one side of the town flows a small stream, the Kaisar, which forms the water-supply of the place, and growing on its banks were to be seen about a dozen trees, scattered here and there, in clumps of two and three, looking quaintly out of place amid the surrounding chaos of sand and stone. Passing through the town we emerged on the far side to find camp pitched at the foot of a small hill.

Over the plain to the north, and clearly visible from our camp, could be seen what appeared to be a small mound of rock, but what was in reality a hill of considerable size, on the top of which stands a stone, one

The Main Street of Nushki.

of the boundary pillars between the lands of his Highness the Amir of Afghanistan and Baluchistan, beyond which lies forbidden ground; but with the exception of this, the objects of interest at Nushki are few, and there is nothing to induce one to prolong one's stay further than is actually necessary to rest the camels.

The future growth and prosperity of Nushki must depend upon whether it or Quetta is to be the starting-point of caravans to cross the desolate stretches which lie between it and Sistan. At present kafilahs make it a halting-place, as they have perforce to go on to Quetta; but it appeared to me as I came along that a line from Quetta would be by no means an impossible undertaking, and in the event of such a line being constructed, Nushki would undoubtedly become a large and flourishing place. Whether the water-supply would under such altered circumstances be equal to the demand is another matter.

That Nushki is a far more suitable starting-point and terminus to the caravan-route than Quetta must be perfectly obvious to any one who has seen the two places; the large, open stretches round Nushki, capable of affording ample grazing for any number of camels, being wanting at Quetta; while standing as it does on the plain, at the same level practically as the whole of the route to Sistan, the ascent of over 2000 feet to the Quetta plateau, most unsuitable to camel transport, is obviated. Since I was at Nushki, sanction has been given for a survey to be made with a view to building a line from Quetta, so that we may hope before long to see Nushki constituted the terminus of the caravan-route.

We started off again on the morning of the 15th, our way lying south-west over a perfectly flat plain towards a mountain peak, Sheikh Husain, which stood up from the plain to a height of upwards of 7000 feet above sea-level, beneath whose jet black sides lay our next camp. Before long we became enveloped in a thick white mist—a most unusual phenomenon I should imagine in this burnt-up corner of the earth—which obliterated everything most effectually, and the next thing we did was to get off the track. This was by no means difficult, as everything looked exactly the same in the fog, and there was absolutely nothing to guide us. The track, too, was merely marked off from the rest of the plain by a broken line of small stones, and here and there by a very shallow ditch, and it was some time before any of us realised that we were off it. When it cleared at about midday, we found we were a good deal north-west of where we ought to have been, with the result that we did not get into camp till after 4 o'clock. We ought, I believe, to have passed at least two villages on the way; but owing to the fog, we had missed them both, and for all I saw the country might have been totally devoid of human habitation.

From the foot of Sheikh Husain the road took us along close under the Kharan mountains, while to the north stretched miles of sand, covered with stunted tamarisk, and broken here and there in the far distance by low hills. On the 17th we camped at Kuchaki Chah, a small thana and well in the middle of a dreary plain of black gravel at the foot of the mountains, at which dismal spot I was most reluctantly compelled to halt owing to an attack of fever; but I was sufficiently recovered to go on again on the 19th, when we reached Padag. The weather was boisterous and most unpleasant, rain being varied by severe gales of wind. After spending a few days in an unsuccessful search for ibex in the Kharan hills, I reached the next thana, Yadgar Chah, on the 24th.

A long march of thirty-one miles or thereabouts brought me to Dalbandin. The track led through collections of yellow sandhills, from which it would emerge here and there on to vast level stretches of sun-baked earth, over which it ran in an absolutely straight line far as the eye could see. The physical aspect of the country showed little change, though as we approached Dalbandin the Kharan hills receded to the south, and the Chagai hills came into view on the north. Technically the country through which the route passes cannot be described as a desert, there being sufficient grazing to support life—camel-life at least—

in many parts, and in a few places even a possibility of cultivation; nor is it composed of the dreaded sea of yellow sand which constitutes the genuine desert, such as exists not very far north of the present trade-route; but after a desert, I should imagine a country such as this, consisting of deserted tracts of sand, earth, or gravel, whose hideous monotony remains unbroken except by a vision of hills, mere excrescences apparently of the unvaried plain, is the most dreary and uninteresting to travel over.

Dalbandin may be described as the end of the first section of the road from Nushki, and bowing down before the god "dastur" (custom), in spite of their having had an easy time, I allowed the camels and men to halt, in order that they should have no possible reason for grumbling. The post differs little from others along the road, except that a bungalow for travellers has been erected, and the thana, which is a large one, contains a post-office. The water is good, and is brought by a "karez" from the hills on the north.

In the neighbourhood of the thana an attempt was being made to grow dates, and about a hundred young date palms had, I was told, been planted; but whether the conditions which according to the proverb are necessary, that they must be grown with their feet in water and their heads in fire, will be realised, remains to be seen.

The weather, which, ever since I had left Nushki, had been most disagreeable, now became what I had been led to believe I should experience the whole way: cold and brilliant star-lit nights, and cloudless skies by day; indeed, it was cold enough up to ten o'clock to make one look forward to the warmth of midday; but from then on to sunset, it was as pleasant as one could wish, the sun's rays being quite hot enough in the middle of the day.

From Dalbandin the road led at times through ground broken by low ridges and mounds, at others over great plains of black gravel, where vegetation all but ceased, and then again over stretches of sand and stony ground, where tamarisk and dwarf palm grew. At Yujaki, about thirty miles from Dalbandin, where I camped on the 27th, there was no thana, but a single shed, roughly built of unshaped stone, and used presumably as a shelter by the post carriers and passing caravans. The water, too, was brackish; but, having been informed of this before leaving Dalbandin, I had brought several skinfuls of sweet water with me, which was sufficient for drinking purposes till I reached good water again at Merui.

Merui, about twenty-one miles on, consists of a thana and bungalow, situated among some low, bare hills, with stunted tamarisk and dwarf palms growing at the foot of them. Here too is a post-office where the post-bag from Quetta to Sistan and *vice versa* is opened, and letters can be posted and received. I was also able to obtain welcome supplies in the way of fowls and eggs from the "munshi" (post-master) in charge, and barley and "atta" for the ponies and men.

From Merui the track lay through much the same sort of country, running at times between low ridges of barren hills and across broad dips having the appearance of long-dried-up river beds, where tamarisk

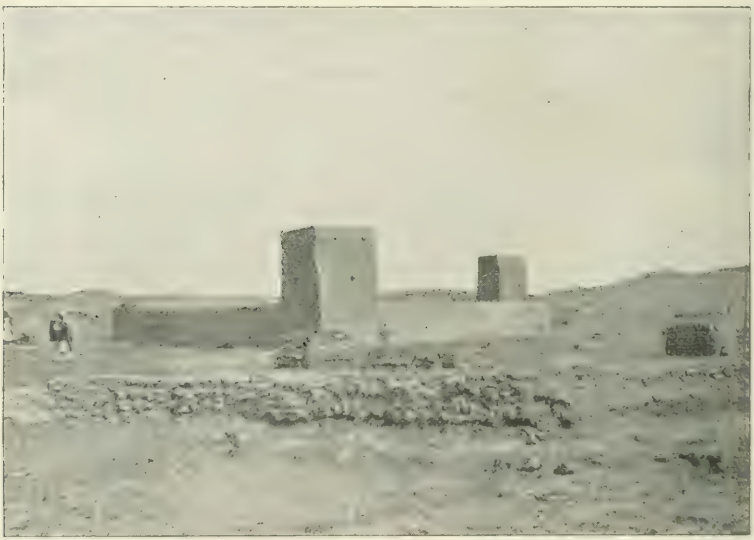
and dwarf palm flourished; at others, over vast plains where vegetation ceased, and nothing was to be seen but huge expanses of black gravel and rock, parched and shimmering in the sun. As we approached Chah Sandan, our next camp, mountains appeared to the north, with jagged, broken outline of naked rock, standing out sharp and clear against the blue of the cloudless sky. At the end of a march of about twenty-one miles I found a somewhat dilapidated-looking thana by the roadside, in the midst of a level plain of stone and gravel, sparsely covered with stunted tamarisk and other dried-up scrub: not much to look at, and for the most part so burnt and withered as to be ready to fall to dust at a touch, but sufficient seemingly for the camels to graze on.

I was now 276 miles from Quetta, and halted on the 30th to rest the camels. The road, as will have been gathered, is a sufficiently dreary one, and little in the way of human life is to be met with; an occasional kafilah, travelling at slow, monotonous pace towards Quetta, and sometimes a small company of men on camels or on foot, marching in the same direction as myself, the latter pilgrims for the most part, on their way to the holy city of Mashhad. Near Kuchaki Chah I had met a kafilah of about thirty camels from Sistan; at Yadgar Chah was a larger kafilah of Pathans, who had come from Herat through Sistan, with loads of dried fruit and other merchandise, and were on their way to Quetta; at Dalbandin there was a dealer with a string of horses, and shortly before reaching Merui I had come across a kafilah of from fifty to sixty camels from Sistan, also travelling east. One feature of every kafilah, and every collection of travellers that I came across, was noticeable, and that was that a certain number, if not the whole of the party, carried arms of some sort or another—a precaution born of experience in these byways of the East—from rifles to huge scimitar-shaped swords. Frequently men were to be seen carrying guns of the most wonderful and obsolete pattern, and I could not help wondering who, in the event of their having to be discharged, would receive the greater damage—the man at the stock or the man at the muzzle end.

From Chah Sandan to Tratoh, a distance of twenty-four miles, the road lay over a vast plain of black gravel, with a horizon on the south and west like the sea, but broken on the north by rocky hills. I found little to call for remark as I rode along this dreary waste. Vegetation there was none, but here and there curious excrescences of sand caught the eye: low, rounded mounds sometimes in irregular patches, but more often in regular lines, looking from afar like chains of entrenchments stretching across the plain. Beyond this nothing but miles and miles of black gravel, the dreary monotony of which was enhanced by a leaden sky overhead. Camp was pitched near a well of brackish water, and the thana, a rectangular enclosure of the usual mud bricks divided into two by a wall across the centre, contained a few low and gloomy rooms in one half, the abode of a daffidar and a few sowars. Close to this enclosure a large circle of huge sacks, arranged in pairs, and the presence of recumbent forms wrapped up in huge "poshtins" (sheep-skin coats),

which on closer inspection proved to be sleeping humanity, indicated the presence of a kafilah, and the number of sacks, that it consisted of thirty or forty camels. "Sistanis on their way to Quetta with loads of wool" was the answer to my inquiries.

Rain came on soon after midday, and continued steadily till 10 P.M., when it ceased, leaving a cold, white mist, which hung like a pall over Tratoh, as I left on the morning of the 2nd. It turned out to be quite local, however, and I soon cantered out of it into a clear and cloudless atmosphere beyond. The same level plain lay before me, losing itself in an unbounded horizon to the south, but still broken by low, rocky hills on the north. Far away to the south-west a low range of hills became visible, appearing a dull blue grey through the dim haze of distance,



A Thana on the Nushki-Sistan Trade-Route.

while to the right of them rested what I took to be a small white cloud on the edge of the plain. As we got farther west, however, far from being a fleecy white cloud it resolved itself into a glittering snow-clad peak, which on inquiry I found to be the Kuh-i-Tuftan, a peak of 12,681 feet, on the Perso-Baluch border. The absence of vegetation was again noticeable during the day, but at Kundi, twenty-two miles from Tratoh, sand was again in evidence, and the ground was covered with a low scrub growing in tufts, and called by my Baluchis "ktrart." One would imagine from its dusty, burned-up appearance, that it was anything but palatable; but the camels seemed to find it good enough.

There is little that calls for remark on the road from Kundi to Mashki Chah, my next camp. Close to Kundi, stunted tamarisk was again to be seen; but this was soon left behind, and the road resumed its monotonous course over plains of stone and gravel. Towards the

end of the day's march, it approached a low range of hills, whose gaunt ribs of rock projected through masses of sand, and shortly before reaching camp we were winding about among low hills of sand and gravel at the foot of the range. Mashki Chah consists of a well and thana, and a few palm trees, surrounded by rocky peaks, rising in fantastic shapes from the low range at the foot of which it is situated; and, taking into consideration the nature of the country which encompasses it on every side, one might be forgiven for considering it almost picturesque.

From here the first few miles led over ground broken by low hills and ridges, but before long we were again travelling over a level plain, skirting a low range of hills on the north. A distance of some miles

The Well at Mashki Chah.

over the level with nothing to afford relief to the eye wearied with continual scenes of dreary desolation, brought us again to a maze of low mounds and ridges, among which we twisted and turned till we reached the wells and small mud shelter of Ware Chah.

From local information I gathered that wild asses used to roam over the plains in this neighbourhood, in considerable numbers, but that the advent of the caravan-route had driven them away, and they had been rarely seen in the vicinity of late. They were, however, so my informant gave me to understand, still to be found in fair numbers, not far from Kirtaka—a post on the route three days' journey farther on—and he knew of two having been shot during the last month.

From Ware Chah the road differed little from the previous march, through leading through a country more uniformly hilly, as it drew towards the Saindak mountains and the Persian border. To the south

the twin peaks of the Kuh-i-Tuftan rose sharp and clear, glittering with their mantle of snow in the glare of the midday sun. The corpses of two camels by the wayside, in a state of rapid decomposition, and already but little removed from gaunt, white skeletons, seemed but a fitting adjunct to the dreary and forbidding aspect of the country which forced itself upon our attention for a distance of twenty-three miles, till the thana of Makak Karez, becoming suddenly visible round a corner, proclaimed the day's march at an end. The water-supply here is brought, as the name of the place implies, by means of a "karez" from some hills near by, and it was a relief to find that it was sweet, for at the last four stages it had been very salt.

A ride of eleven miles brought me to Saindak at the foot of the mountains on the Persian border, where I found a well and spacious rectangular courtyard, containing at one end eight or nine rooms, including a post-office. On all sides bare hills rose up in rugged, irregular shapes, streaked with odd seams of colour, from brick red and salmon pink to purple and sombre black.

Both men and beasts were ready for a rest, so I halted here on the 7th. Not far from the thana stood a few huts, the first thing I had seen in the shape of a village on the road since leaving the foot of Sheikh Husain.

The road from Sainduk to Kirtaka—seventeen miles—lay for the first few miles among the hills of a spur projecting from the main range, whence it emerged on to the edge of a vast plain—the skirts of the real desert, which lies to the north-east. Along the fringe of this plain, and skirting the hills on the west, it ran in a north-westerly direction to Kirtaka, the usual building on the edge of a patch of yellow grass.

From Mohammed Reza Chah, seventeen miles beyond Kirtaka, a vile apology for a road pursued its way along the foot of the hills from which great furrows ran down to the plain, cutting the track at right angles, and giving it the appearance of an angry sea troubled by a heavy ground swell more than anything else. Along this we walked and cantered alternately, and at the end of a couple of hours came upon a kafilah of seventy or eighty camels bringing loads of wool and almonds from Mashhad. Another hour of uninterrupted going, and a large white stone became visible standing upright on the plain about 100 yards from the track. At this point three countries meet—Baluchistan, Persia, and Afghanistan—the forbidden lands of his Highness, Habibullah Khan, stretching away to the north-east. A few hundred yards below this, the road left its course along the foot of the mountains, and entered them, winding thence amongst the precipitous cliffs and jagged peaks of the many-coloured Kuh-i-Malik Siah, till it reached Killa Robat on the Perso-Baluch boundary. The thana here was a substantial one, and a bungalow, then being built, should very soon be ready for the accommodation of travellers. I found a kafilah, also from Mashhad, carrying loads similar to the one I had already passed on the road.

Halting a day at Robat, I left for Hurmak on the 12th, by a road taking a fairly level course through the Kuh-i-Malik Siah, keeping just on the Persian side of the boundary, and running now due north.

Occasionally glimpses of the real desert to the east could be seen through openings in the hills, but otherwise there was little of interest, and an uneventful march of seventeen miles brought us to camp, pitched on the edge of a large patch of tamarisk jungle, and close to some springs of excellent water. From Hurmak the road took us down a dried-up river bed, and emerging from the mountains, led over a huge stony plain with an unbounded horizon on the north and east. Some miles of sand took the place of stone, and stunted tamarisk sprang up all round. At one place we came to a fair-sized stretch of water, but beyond this there was nothing to mark time or distance, and we reached camp at Nawad Chah after a march of about twenty-four miles. This is a new well, dug within the last few weeks, to shorten the long march to Girdi Thana, and a small domed mud house had also been erected.

Girdi Thana is not far from Nawad Chah, probably not more than six or seven miles, and the road, or rather track, connecting them lies over an absolute level, covered plentifully with tamarisk. From here, dotted all over the plain, are to be seen the remains of ancient cities, all deserted and fallen into decay. I visited one within a couple of miles of camp, and found walls and the lower parts of houses standing, but the whole had the appearance of having been long deserted, owing to the domes having all fallen in, and to drifts of sand having been blown against the walls. From the latter I could see with my glasses any number of similar ruins, dotted over the plain in every direction, some of which have, I believe, been deserted for many years. My escort told me that the villages all round had been deserted for over 200 years ; but though some have undoubtedly been deserted as long or longer, I have good reason to believe that the majority were left by the inhabitants owing to changes in the course of the Halmand depriving them of their water-supply about thirty-five years ago. The early history of many must date back for centuries, for coins and seals of Greek and Assyrian times are dug up by the natives, and legend credits them with being the birthplace of Rustam, greatest hero of Persian myth.

From Girdi Thana to Asak Chah, a march of twenty-two miles, the track lies over the same interminable plain, with an unbounded horizon on all sides, except where the thin line of the Kuh-i-Malik Siah is still visible to the south. As we got further, vegetation became thinner and scarcer, till at times we were traversing huge wastes of soil, hard and smooth as asphalt, which extended as far as the eye could see in every direction. About fifteen miles on we came to a large deserted village, in a state of fair preservation, called Hauzdar. Some of the upper storeys of the houses were still standing, and from one of these I obtained a view over the whole village, a mass of broken down and decaying domes and walls. The outside walls were intact, and still in a state of sufficient preservation to prevent any one walking into the city except by the single gate. All round in every direction could be seen similar remains, and Hauzdar must in days gone by have been a place of considerable size and importance. At Asak Chah I met a number of nomad shepherds with large flocks of sheep, sign that I was on the fringe of a more inhabitable country.

Leaving camp at 9 A.M. the next morning, we made for some low hills which rose from the plain, and a few miles on I was met by Sirdar Sayed Khan, a Baluch chief of the neighbourhood, with a following of about a dozen mounted men, and also by two sowars of Jacob's Horse, sent out by Major Trench to escort me. After the usual exchange of compliments, we rode on to Sayed Khan's Khel (village), about ten miles from Asak Chah, where I found my tents pitched, and shortly afterwards the chief paid me a visit in my tent.

The Amir of Sistan had sent out his mules to help me over the last twenty miles that lay between myself and his capital, a kindness which I greatly appreciated when I saw what sort of a road it was that led up to the chief town in Sistan, and still more when I learned that his own private mules were the only ones in the country. The whole face of the country changed these last twenty miles; instead of a dry, waterless plain, it became a plain intersected with ditches and canals, covered with low scrub jungle, and with pools of water, making travelling anything but pleasant, for, with the exception of one or two lately made by Trench, the recently appointed British Consul for Sistan, there were no bridges, and the canals being often deep, wettings were unpleasantly frequent. Villages were dotted about over the plain, differing little from the ruined specimens I had already seen, except that they were inhabited.

A few miles out from Nasratabad, Trench met me, escorted by two sowars of Jacob's Horse, carrying a small Union Jack on a lance. A little farther on the low houses of a mud town became visible on the horizon, and in a short time we were winding in and out through tortuous and narrow lanes, between the small and irregularly built houses of Husainabad, the southern portion of the capital. From narrow alleys we emerged on to a graveyard unenclosed in any way, and spread out like a carpet in front of the Russian Vice-Consul's house. Before us rose the walls of Nasratabad, the northern city, and to the east stretches the unbounded plain. Here, a few hundred yards from the town, under the shadow of the Union Jack, flying from a thirty foot flagstaff, was to be seen a neatly laid out settlement, the home of the English Consul and his staff. My journey for the time being was at an end, and I looked forward with pleasure to a rest in Sistan ready to appreciate to the full the companionship of a fellow-countryman and the comforts and luxuries of a fixed abode, after many days of solitary marching over the stony wastes of inhospitable Baluchistan.

I have endeavoured to show that the journey from Quetta can, thanks to the admirable way in which Captain Webb-Ware, the officer in charge of the route, has carried out his duties, be performed with ease and comparative comfort, that supplies are forthcoming at all the larger posts, and that water and grazing exist for camels at every stage. The climate is in the winter as a rule fine and dry, cold at nights and in the early mornings, with a warm sun in the middle of the day, and it is in winter that caravans at present travel over it; but I am assured by those who ought to know, that though the heat in the daytime is very considerable, there is no reason why caravans (who prefer travelling by night when feasible) should not find the route in every respect as satisfactory a one

in summer as in winter. The total rainfall is very small, and for some years has not averaged more than a few inches, which makes cultivation impossible except in selected spots in the vicinity of the mountains, where artificial irrigation is possible by means of "karezes"; and it is for this reason that the country over which the route passed has the appearance of a deserted and uninhabited waste, such villages as there are being situated at the foot of the mountains and as far removed as possible from the dead stretches of unproductive plain. As far as Dalbandin there should be no difficulty about supplies, even when the traffic becomes far greater than it is at present, as local cultivation should be possible for this section; but from Dalbandin to Saindak cultivation would hardly be possible, and supplies will have to be brought from Nushki and the Nushki-Dalbandin section, and for the latter half of this section from Mirjawar and the country round it on the Persian border, where I was told there was cultivation and cultivatable land in plenty. With so fertile a country as Sistan within a few days' journey, no anxiety need be felt on account of supplies for the remainder of the journey.

Having reached, after many days of marching across such arid wastes as I have described, the capital of little-known Sistan, one's first impression is that there is little to see and still less to rouse one's interest in the tumble-down, dilapidated mud city, which has the appearance of having been dropped down haphazard in the middle of a vast and cheerless plain. The entire absence of roads, the untidy and neglected appearance of Husainabad, the southern town through which one rides on entering the capital from the south, the narrow winding lanes which serve for streets, and the total want of method displayed in the arrangement of the low-domed houses, which stand together in irregular clumps, all tend to produce a feeling of disappointment on one's first glimpse of the capital.

The present capital and seat of what the Persians are pleased to call the government consists of two towns, or rather of a town divided into two parts, the southern half known locally as Husainabad, and the northern, which is entirely surrounded by high city walls, and known as Nasratabad. Beyond these two towns have sprung up in the last few months the neat buildings of the British Consulate, which may be said to constitute a third part of the capital, and which I heard talked of on all sides as Trenchabad, *i.e.* the city of Trench. Husainabad, as I have already mentioned, is little more than a collection of small domed mud houses, built irrespective of ground plan, wheresoever fancy dictated, in the middle of a vast plain. Here and there a windmill of curious shape stands up conspicuous among the surrounding houses, usually stationary in the winter months, but wanting only the fierce blasts of the "Bad-o-sad-i-bist roz," or wind of a hundred and twenty days, which blows unceasingly throughout the summer months, to rouse it to a state of wild activity. Beyond this the houses of the Russian Vice-Consul and the head Mullah are the only other objects likely to attract one's attention.

Nasratabad, the northern town, though little to boast of, is by far the more imposing of the two, being enclosed by high walls, about 350

yards in length from north to south and 400 yards from east to west, with buttresses at intervals of about 40 yards. An additional rectangular enclosure, projecting from the north-east corner, contains the arc or citadel, in which is situated the palace of the Amir. In the centre of the southern wall stands one of the two gateways of the city, supported on each side by a buttress, and from here the central street runs the length of the city, terminating in a similar gateway in the centre of the north wall.

With a single exception, the houses and shops on either side of the street are small and insignificant, the latter hardly recognisable as such, owing to their apparent innocence of goods for sale; while the owner is content to sit in front of his door, in a state of apathetic indolence, typical of all things great and small, from the highest to the lowest, throughout the dominions of his Highness Muzaffar-ad-Din Shah.

The exception to which I have referred is a commodious and well-built shop, midway between the south and north gates of the city, where goods of European manufacture of all sorts and kinds, included under the general heading of piece goods, are sold by an individual who, as far as this branch of his business at any rate is concerned, corresponds to the general dealer of the West. The owner of this establishment is one Seth Suleiman, an Indian merchant who left Quetta at the end of 1899 with a capital of 20,000 rupees to exploit the trade of Sistan; a venture which had already met with considerable success, and at the time of my visit he was making a very large profit on his capital, which he informed me was not nearly large enough to admit of his carrying on the trade of which the place was capable.

In addition to Nasratabad and Husainabad, there remains the more modern part of the town, which I have already spoken of as Trenchabad. Separated from the rest of the city by a "maidan" (stretch of level ground) of some acres, it occupies an admirable site, and has the advantage of room for extension, should it at any time be thought advisable to embark upon enlargement.

Between two rows of buildings is a wide space more nearly a square than a street, at one end of which flies the Union Jack from a flagstaff planted in a solidly built pedestal of mud. Behind the main block of buildings on the south side of the square are one or two other buildings, the most interesting of which is a mosque, if only from the fact of its having been built by an Englishman. The main buildings cover a space of about 150 yards by 70 yards, the whole site consisting roughly of about thirteen acres, and when it is considered that the whole of the buildings, including the Consul's house, guard-room, cavalry lines, staff and servants' quarters, mosque and all were completed for a sum of 2500 rupees (£166), Trenchabad may probably claim to be the cheapest town on record.

Such was the city I found in December 1900, which in the space of twelve months has been roused from the state of torpor of a true house of the Orient, untouched by the influence of western progress, where time stands still and change is unknown, to the surprising fact that there were worlds beyond its own and people of an alien race who

had stirred them, vastly to their own amazement, to a state of—to their ideas—extraordinary activity.

The day after my arrival I called on M. Miller, the Russian Vice-Consul, whom I found most cordial and agreeable, speaking English exceedingly well, and, as I afterwards found out, a fluent master of the language of the country, an acquirement of the greatest importance to any one entertaining hopes of dealing successfully with the Persian. Later in the afternoon I paid a visit in state to the Amir, who rejoices in the title of Hashmat-ul-Mulk or glory of the country, and the spectacle of the British Consul and myself, the former in full uniform, while I had donned black frock coat and patent leather boots, riding solemnly through the narrow alleys of the crumbling mud city, accompanied by a full escort of Pathan sowars, must have been well calculated to inspire laughter had any one capable of appreciating the humour of the situation been present to witness it.

Having entered a walled enclosure in front of the Amir's palace, where were to be seen prisoners bent and groaning under chains and irons of the most appalling size and weight, and having acknowledged the salute of a ragged-looking cut-throat with a gun, presumably one of the much-talked-of army, on sentry duty, we dismounted and were forthwith ushered into the presence of the governor. The reception hall was large for Sistan, and might have been 18 or 20 feet in length by perhaps 10 or 12 in breadth, with a recess in one side containing a fireplace, in front of which were placed a table and three or four chairs. The only ornamentation on the mud walls was a dado of cretonne, and on the table was a cloth of bright yellow cotton, with a deep border of gaudy red roses. Overhead could be seen the funnel of a "bad-gir," or air shaft, for catching the wind in the hot weather.

On entering, the Amir, a pleasant-looking man of medium height, with black beard and moustache, rose to meet us, and, having welcomed us with courtly bow and stately handshake, motioned us to seats on either side of the table, and with the greatest solemnity and deliberation then took a seat between us. Pausing a moment—a Persian is never in a hurry—to be sure that we were seated, he made the polite inquiry never omitted, asking if we were well, and answers having been given and similar demands for information as to the state of health of the ruler having been made, preliminaries were at an end, and we were at liberty to talk on any subject that might suggest itself.

Owing to my inability to speak the language, the brunt of the conversation devolved upon Trench, and was for the most part confined to generalities. The Amir spoke of Tihran and Mashhad, both of which places he had visited, and was quite familiar with the idea of railways and similar innovations of civilisation; and though his knowledge of such subjects rested on the single example of a line the country can boast of, the light railway from Tihran to the mosque of Shah Abdul Azim, a distance of a few miles only, he spoke with assurance of the advantage of a line from Quetta to Robat, which he looked upon as a certain production of the near future: indeed I heard the advent of a line along the new trade-route discussed with much more certainty by

the higher class Sistans, who look upon the question of its ultimate construction as in no way open to doubt, than I did at the Quetta-Nushki end of the route.

Meeting him casually like this, one receives the impression of a quiet, dignified gentlemanly man, content to live quietly as the ruler of his province, and desiring only to be left in peace and quiet. Though ostensibly an Anglophile, he is shrewd enough where his own interests are concerned, and stands in wholesome awe of his superior at Mashhad, who, as he well knows, is under the sinister influence of Russia. So that though willing to assist British interests as far as he considers compatible with his own safety, he could hardly be relied on to take any very active part in the furtherance of British trade and prestige, as long as there is a possibility of its being reported against him at Mashhad through the agency of the Russian Vice-Consul, his policy being strongly flavoured with a desire to please both parties; and he may be looked upon as a friend and ally in so much as he will continue to show such signs of friendship towards Great Britain as will not endanger his own position.

Having made the acquaintance of the Amir, I now turned my attention to the two people of next importance, Mir Mansum Khan, the Sartip, and Mohammed Reza Khan, the Sarhang, both sons of the ruler; and the same farcical procession that had proceeded to the Amir was again on view. The house in which the Sartip was living is situated in the only garden of the place, a few hundred yards to the north of Nasratabad, while the Sarhang had a house within the walls of the city. As I visited them both the same afternoon, I was afforded an opportunity of comparing the two candidates for the future possession of the sceptre in Sistan, a comparison which I am bound to say was more than favourable to the Sartip. Both are of the same age, twenty-one according to the Sarhang (December 1900); but the difference between the two could hardly fail to strike the most casual observer. On visiting the Sartip, I was received by a quiet, gentlemanly man with perfect manners, and, when he talked, seldom without a pleasant smile despite a distressing disease of the eyes from which I was sorry to see he suffered. In strong contrast was the loud-voiced welcome accorded me by his more flashy brother, who had, I fear, imbibed a good deal more spirit than was good for him, and talked and laughed uproariously throughout the interview.

The Sartip received us in a room which, like the Amir's hall of audience, was without ornament: a few chairs, a table, and divan making the sum-total of the furniture. I could not help smiling when I noticed a large white bath towel of European manufacture neatly spread over the table in place of a table-cloth. At the time of my visit he was very full of a proposed journey to India by the Nushki route, with a view to consulting a first-class occulist about his eyes, and as I had just travelled along the road, this subject naturally formed the chief topic of conversation. From the eagerness with which he questioned me, and the interest he took in my answers, I judged that he was very anxious to get started, and a good deal excited at the idea of crossing

the gulf between Persia and India and of seeing for himself the wonders of the great empire that lay beyond.

There is very little doubt that the Sartip is a man of far stronger character than either his father or his brother; and it is equally certain that as far as Sistan is concerned he is the man of the future, provided always that the developments of the future, in which alien powers must play a predominant part, will admit of a native of the country occupying a position of anything more than a puppet. Public opinion, at any rate, holds no two thoughts as to who will wield the sceptre in the future, and from what I heard and from the little I saw of him during my stay in Sistan, I am inclined to think that he will make a strong and powerful ruler. Even at this present time his influence is very great, especially through his mother—a Baluch lady of very high family—among the hordes of Baluchis who cover the country from Sistan to Herat.

I have mentioned the boisterous manner of the Sarhang, whom I found to be a very coarse edition of his brother. He ushered us into his room with no very steady step, and having indicated by a lordly sweep of his hand the chairs he desired us to occupy, plumped down on to a third with such clumsy violence, that the article not altogether unnaturally gave way. In no way abashed he threw the broken chair aside, and with a remark which was presumably of a jocose nature, judging from the uproarious laughter with which he followed it, succeeded in seating himself in another. The fittings and ornamentation of the room afforded evidence of the extravagant and uncultured taste of the man, every niche and corner displaying an incongruous jumble of vulgar trash. As may be imagined, there was not a great deal to be gathered from his conversation, and beyond eliciting the fact that he had been struck by the advantage of well-built houses since he had witnessed the success of Europeans in this line, and had become an enthusiastic builder himself, and that he was also interested in gardening, I gained nothing but an impression of a shallow and extravagant man who placed his own whims and pleasures first and all else nowhere. In extenuation, I must admit that when he returned my visit a few days later, in a condition of sobriety he presented a much better appearance, and talked much more quietly and sensibly; but at the best he is not to be compared with his brother, whose temperate life and habits and strength of character are as striking as are the intemperance and weakness of the Sarhang.

For the rest, there are few men in Sistan who can be looked upon as likely to make any name in history. The two chief Sirdars are Sirdar Purdil Khan and Mir Abbas, the first of whom played a more or less prominent part in local history a few years ago. From all accounts he is a man of fine physique and of a bold, independent spirit, as his name, signifying lion-hearted, suggests, and I can well believe that he is a man to command respect among his own people, if he at all resembles his son, whom I had the pleasure of meeting. In Mir Abbas one sees a picture of good-natured content in the disguise of a country squire, who asks no more than to spend the days of an un-

ambitious life, surrounded by the grandchildren of a somewhat prolific family, in the peace and quiet of his own domain.

In addition to these permanent inhabitants, there were one or two visitors, all making a more or less prolonged sojourn in the land, carrying on their business, when they had any, with that contemptuous disregard for time which is so noticeable a characteristic of Persian methods. One gentleman who was on his way round the country in the capacity of official herald of the safe return of the Shah from his trip to Europe, had already occupied six weeks in making known the glad news in Sistan, during which time he was the recipient of presents and hospitality at the expense of the province, as being an emissary from headquarters, and as long as such hospitality continued to be on a sufficiently magnificent scale to satisfy him he would no doubt remain, only passing on with his news when he found there was little more to be gained by stopping where he was. News carried by such a messenger must become a little stale before being conveyed to all for whom it is intended.

If I found no difficulty in getting to Sistan, I found that getting away again was quite a different matter. The only form of transport in the country was camels, the few mules there are being the private property of the Amir, and the only camel man who was willing to proceed in a northern direction was a sulky and vacillating Birjandi, who could in no wise understand why the "feringhi" should be in such a break-neck hurry, the passing of time being an unconsidered quantity in his Oriental conception of life. I had calculated on sending off my camp on the 1st, and on following myself on the 2nd; but so many difficulties had to be overcome that the final start was not made till the 13th.

A sharp frost had dried the ground and covered all the pools and puddles with ice, leaving a keen bite in the air as I jogged along westward under a cloudless sky. Away over the Hamun and Naizar, clouds of duck and wildfowl were to be seen flying in all directions, testifying to the numbers that exist on this vast expanse of water. Once past the Hamun, we got out of the rich alluvial soil of Sistan, and made our way over huge, bare plains of gravel. In front of us lay a low ridge of barren hills, and farther away to the south-west stretched a line of snowy mountains, glittering in the morning sun. We had been going for about three hours when my horse went suddenly dead lame, and became so bad that I was forced to get off and walk, no very great hardship, however, on a bright winter's day, and leaving Ralmat Khan to bring him along, I stepped out, and an hour and a half later reached camp, pitched by a small stream, a few miles from the foot of the hills in front of us. Though the water of the stream looked clear and good, I very soon discovered that it was extremely bitter, and during my stay here, the nauseating taste of salt water permeated all my food.

Night was again very cold, and clouds began to gather on the horizon as I left camp on the morning of the 15th. A short distance over the same stony plain brought us to the foot of the hills, which we entered by a defile between high walls of rock. At the mouth of this

passage through the hills was a grove of palm-trees, with a small village standing on the edge of it, from which the inhabitants flocked to gape at the strange spectacle of a white man riding through their midst. As we rode on over a level stretch of cultivated soil between ridges of rocky hills, more signs of habitation became apparent, and small collections of houses enclosed by high mud walls, little clumps of trees, quaint-looking windmills, and tiny patches of young green barley, all went to show that we were over the desolate and uninhabited stretches on the north-west border of Sistan, and were once more in a country possessed of a sprinkling, at any rate, of inhabited and cultivated oases.

I was entirely in my camel men's hands as far as time and direction were concerned, and from here they went across country, leaving the main caravan route which passes through Nih, and which I did not again strike till within four marches of Birjand, and camping whenever they considered that they had marched far enough. My progress, consequently, through an intensely dull and uninteresting country, was far from rapid.

On the 16th we marched over a level stretch at first of good soil, and then of stony ground, while all round barren hills rose in isolated groups and ridges from the plain. Towards the end of the day's march on the 17th we got into more mountainous country, where here and there hills higher than the rest were lightly flaked with snow, affording some little relief to the dreary dust-colour of the whole landscape. As I was leaving camp on the 18th, two Baluchi sowars rode up, on their way with the mail-bag to Birjand, carrying also some letters for me forwarded from Nasratabad. We rode along together for some way, over the usual monotonous stretches of gravel, earth, and rock, till we came upon the tents pitched in the very middle of a cheerless plain. Though not so cold as it had been of late, heavy clouds hung threateningly all round, and the outlook was indescribably dull and dreary. On the 19th we made better progress, getting over about thirty miles during the day, through country much the same as usual, though the plain was covered for the greater part of the way with large, leafless bushes, grey, dried-up and dead-looking. Towards the end of the march we skirted along the edge of a large swamp, surrounded by great patches of glistening salt, to the east of which rose a bare mountain range of burnt sienna, smudged here and there with odd patches of brick red.

Near the head of the plain along which we were travelling, we came upon some acres of cultivated land, and a village of perhaps 150 small domed houses, massed closely together, the inmates of which crowded to their roofs to stare at us. Our road took us along the "karez" or "kanat" which brought water from the mountains at the head of the plain. Parallel to, and within a few yards of, the one in working order, were the shafts of an old and disused one, the people preferring, it would seem, to construct an entirely new kanat to repair an existing one which happens to have got blocked, though where the economy in making an entirely new aqueduct in place of repairing an old one comes in is not altogether obvious.

We now crossed the hills at the head of the plain, passing a kafilah of forty camels *en route* for Sistan, which showed that we had once more joined the regular caravan-route, and, entering an elevated valley which boasted of a certain amount of cultivation, camped at the second of two villages which we came to. The people were inquisitive and curious, and gathered in crowds round my tent.

On the 21st we continued for some way along the valley, bordered on the west by a fine range of mountains deep in snow, and then ascended by a steep pass to higher ground, where snow lay to a depth of six or eight inches. For the rest of the day we were winding about among hills and in snow the whole time, till we reached a sheltered hollow in which were situated a couple of villages, where we camped.

The 22nd was a miserable day: a thick white mist shrouded all the hills, heavy clouds hung low in the sky, while a biting wind blew in fitfull squalls, adding to the feeling of discomfort already produced by the cold, raw air. The camel men had refused to take my advance camp on over-night, and though they had started with daylight, I soon overtook them, and at 1 o'clock reached Mud, a large village on the edge of the snow. In addition to the village itself, which covered a considerable area, there was also a large walled enclosure or citadel, a little apart from the rest.

Next day I reached Bujd, a village inhabited by Sunni Mohammedans, and the day after entered the capital, Birjand, a large mud town, shortly after midday.

Owing to the uneven nature of the ground on which the town is built, one sees but a small portion of it from the plain over which one rides when approaching from the east, and it is not until one has climbed one of the many low, irregularly-shaped hills which surround it, and looked down on it from above, that one can claim to have seen the city in its entirety. From such a point of vantage one sees spread out before one a stretch of hilly ground thickly covered with a mass of irregular, domed houses, with here and there an edifice larger than the rest, standing out conspicuous with upper storey and bald, flat roof, usually the residence of some servant or retainer of the Amir. At the south-east corner stands the old fort, the usual high mud walls enclosing a few houses and a fine mosque and courtyard, built and completed by the present ruler about five years ago, by far the finest building I saw in Birjand, which has little to boast of in the way of architectural beauty. Through the northern part of the town a broad thoroughfare runs crescent-wise from east to west, dominated at its western extremity by the new fort, an erection standing on the summit of a low hill. It is known as the "new fort," but would appear to have very little valid claim to either title, consisting as it does at the present time of decayed mud walls enclosing the remains of what might once have been houses. I was struck with the spectacle of such a fine broad thoroughfare in a town which for the rest boasted of nothing but narrow lanes and winding alleys, often mere tunnels beneath a conglomerated mass of buildings; but the result of inquiry showed that it was no fault of the people that they were possessed of so spacious a street, as it was in

reality the bed of a stream which in the wet season returned to its original office of waterway. On each side of it stood lines of small shops, and on the northern side was an imposing caravanserai, quite recently completed.

From conversation with various people I gathered that Birjand was a great trading centre, and that besides one large and several smaller madressehs and schools, there were six or seven large serais for the accommodation of the kafilahs which were always coming and going. The population was generally agreed to be about 30,000, which points to the increased prosperity of the town of late years, for in 1890 it is spoken of as a town of about 14,000 inhabitants, while Colonel Yate, when visiting the place in 1894, put down the population at 25,000. The chief water-supply is brought from the hills by karez; but this is hard and brackish, and for drinking purposes rain water is caught and preserved in large tanks. Among other institutions which I noticed were public baths, and not far from my house stood one of these unwholesome-looking dungeons. The appearance of the exterior, however, deterred me from inquiring personally into the system and management obtaining in the interior, though as I witnessed steam escaping from chinks in the mud roof, which was little above the level of the ground, I conclude that it is something akin to a Turkish bath.

Starting on 4th February, after leaving the straggling houses on the outskirts of the town behind, we travelled in a northern direction over a flat expanse bounded by a range of mountains from which long lines of kanat shafts, looking for all the world like the tops of miniature volcanic craters, stretched away in various directions, carrying water to the villages which were dotted here and there over the country. Much of the land was being ploughed—the plough, a rough implement of wood, being drawn by a cow and donkey harnessed side by side, a quaint though apparently satisfactory combination; and it is possible that there are times of the year when the terrible monotony of the uniform dust-colour of Birjand is broken by fields of smiling corn and the blossom of the many kinds of fruit said to grow there.

On the 5th we crossed the range in front of us by the Saman Shahi pass (7000 feet), where snow lay deep on the ground, at the top of which I was afforded ample opportunity of ruminating on the natural disadvantages of the ungainly build of the camel, which renders all ground, with the exception of a perfectly level and dry plain, so peculiarly unsuitable to his movements, while I looked on helplessly at the clumsy efforts of my transport animals as they slid and slithered about on the slippery surface, halting every few yards to gaze round with the aggravating expression of injured innocence, with which one becomes so familiar, only to flounder on again with a protesting gurgle to the vociferous exhortations of the drivers.

Having wasted the greater part of the morning in seeing them safely over the worst places, I went on ahead down a gradual descent, passing here and there a small village in a sheltered hollow, and little patches of cultivated land often enclosed by mud walls. Evening began to close in, bringing with it no signs of Rum, a village at which I purposed camp-

ing for the night; and thinking I must surely be somewhere near my destination, I took the first opportunity afforded by a small cluster of domed huts of inquiring how far it was. In reply I was informed that at present it was twelve miles, but that if I continued in my present direction, it would soon be a good deal farther. This was a little disconcerting, as I had followed the only visible track; but none the less further questioning elicited the fact that we were off the road to Mashhad, and should have to go several miles before we could get on to it again. Following the direction indicated by our informant, we were lucky enough to strike a fair-sized village called Sadik at seven o'clock, where as luck would have it there was a good caravanserai, about seven miles from Rum. What had become of the camels goodness only knew, as nothing had been heard of them in the village, and by ten o'clock I gave up all hope of seeing them before day, and having dined off some native bread obtained in the village, I got hold of some straw, and lay down to sleep as I was, on the floor of one of the untenanted rooms of the caravanserai. It was bitterly cold, and what with having had scarcely anything to eat, and being entirely without blankets, I did not pass a very enjoyable night.

Next morning I sent out men to search for the camels, while I got on to the roof of the serai and scoured the country with field-glasses. About midday they hove in sight, and half an hour later reached Sadik. It seemed that they had also lost their way, and had been aimlessly wandering over the plain, a fact which will give some idea of the nature of a Persian road. As soon as they reached Sadik, I went on, getting over the remaining distance between us and Rum by evening.

In the evening we reached Kain. Judging from what I saw, I should say that a great deal of fruit must be grown here, for I marched for nearly two miles among orchards and cultivated fields enclosed by mud walls, before coming to any sign of houses. When I at length came to the town itself, I found a solid-looking gateway barring entrance to the main street, supported on each side by a tower, the whole of which would seem to be a little superfluous since the place was without walls. After proceeding through the usual alleys of a Persian town, we reached the caravanserai, a moderate example of the article, and I set to work to clean out the hovel in which I purposed passing the night.

The town had the appearance of a large village surrounded by trees, with one large building standing up high above the rest of the houses, which I was informed was a mosque. The population is, I was given to understand, about 1000, but the only fact of any interest that I gleaned about the place was that it is famous as a great place for growing saffron, a valuable export, which has taken the place of the silk for which it used to be noted.

By evening we reached the village of Asadabad, where we spent the night. The next day our road lay over a dreary, shora-covered plain, where all sense of distance was annihilated, and though Dasht-i-Piaz, the village we were making for, built on the slope leading up to a range of hills at the end of the plain, appeared quite close at midday, it con-

tinued to do so in a tantalising and aggravating way, while I tramped along steadily for another four hours before reaching it.

A peculiarity I noticed of the people of Dasht-i-Piaz and other villages in this neighbourhood was the fashion in head-dresses, which took the form of huge sheepskin hats in place of the more usual "paggree."

Leaving Dasht-i-Piaz at 8.30, we went up a gradual ascent into the mountains in front of us until one o'clock, when we came to a sudden and very steep descent down a defile between precipitous, and in many places snow-covered, mountains. The camels having been got safely down to more level ground, we followed a dry river-bed which pursued a winding course along the bottom of a tortuous ravine, and at 3 P.M. reached another steep pass over a ridge of hills. The camels were, however, able to avoid this by taking a rather longer road, and I left them to follow the level, crossing the hills myself.

From the top of the ridge Kakh was visible almost immediately below us, its houses nestling among clumps of trees at the foot of the mountain. Immediately opposite the serai was a large building surmounted by a fine dome of enamelled bricks in yellow and light and dark blue, which I was informed was the tomb of Sultan Mohammed, younger brother of Iman Reza, the saint whose remains invest Mashhad with such a degree of sanctity, and, of course, a resort of pilgrimage. As I passed it on entering the serai, several devout worshippers were prostrating themselves to the ground before the holy threshold. Beyond this there was a high-walled enclosure, presumably the font, in the usual state of decay, and several mosques, as befitted so holy a place of pilgrimage.

I left Kakh on the 12th, getting all the camels loaded and ready to start by 8.30 A.M., and journeyed over a level plain away from the snow-covered mountains above the town. The march to Gunabad, though supposed to be four "farsakhs"—a "farsakh" is an elastic term indicating a distance of from three to five miles according to the part of the country one happens to be in—was certainly a good deal less, and we reached the serai on the edge of the town by 3 P.M.

After leaving Gunabad we passed during the first two or three hours through a large and smiling oasis of well-kept fields, many already green with the young shoots of corn, and flourishing villages, a pleasant change after the usual tracts of barrenness; but having left these behind, we emerged once more on to brown, uncultivated plain, reaching the village of Amrani by evening.

Between Amrani and the next inhabited country stretched a sterile and inhospitable plain for a distance of eight farsakhs, and as my camels seldom succeeded in covering more than four, or at most five, farsakhs during the day, I found it necessary to carry water, firewood, fodder, etc., from Amrani, so that I should be able to halt for the night at an empty building which was said to exist half way.

The landscape was one such as is common in Baluchistan and Khurasan, a vast expanse of level with a vision of hills in the dim distance beyond. Overhead the sun shone from a cloudless sky; but

during the morning a strong wind blew in fitful gusts, raising a whole host of sand-devils, that spun in wild gyrations over the dreary waste. Mirage, too, dazzling the eye and bewildering the senses with its elusive and incessant tremor, produced for our edification some of its most fantastic illusions, a weird sample displaying a flock of sheep floating gently about in the air with a filmy blue vapour beneath them. During the day I passed a caravan of about forty donkeys, and noticed on one or two occasions shepherds driving their sheep and goats over the plain to pick up what nourishment they could from the dry and dusty scrub that grew there. By 5 P.M. we reached the building, a large, empty barn obviously devoted as much to animals as to men. A small party of Hazara pilgrims also spent the night here. I had met one or two of these pilgrims before, tramping wearily along to Mashhad, and I am bound to say I could not help being struck with their implicit trust in Providence. One man I call to mind accosted me on the road before I reached Sistan, begging for a meal and a little money. Six weeks later I met the same individual close to Birjand, still tramping light-heartedly along with not so much as a coin in his pocket, his worldly goods consisting of a rug, which he carried on his back. He was entirely dependent on the hospitality of the villagers he met for mere existence, yet it never so much as entered his head that he might never reach the holy city.

The following day we crossed the remainder of the plain, reaching a village called Khairabad, at the foot of hilly ground, and next day reached Turbat-i-Haidari. Thence a toilsome journey over mountain-ridges covered with ice and snow took me to the holy city of Mashhad, the end of my journey.

THE NUSHKI-SISTAN ROUTE FROM QUETTA TO EASTERN PERSIA.

By S. H. F. Capenny.

(*With Map.*)

The Nushki route is an ancient Indo-Persian highway which the Government of India has been having energetically opened up and developed anew since December 1896. The commercial and strategical importance of Nushki had been previously well known and recognised, as by Sir C. Macgregor, Colonel Mark Bell, and Lord Curzon. Colonel Mark Bell in his Report on his journey from Quetta to Trebizond in the autumn of 1888, which was printed at Calcutta in 1892, and Lord Curzon in his work on Persia, which likewise appeared in 1892, had both advocated immediate consideration of the Nushki route to Sistan. It was hardly possible, however, at that time for this route to be utilised as a commercial highway on account of local insecurity and of political uncertainty regarding territories and boundaries. The most direct route from Nushki to Sistan led through the Chagai district to the Halmand, and

this district had been occupied by the Amir of Afghanistan, who was opposed to caravan trade through his territory and levied prohibitive duties. It was therefore necessary for caravans to make their way farther south, where other uncertainties regarding territory were encountered between Baluchistan and Persia. It thus happened that between Nushki and Sistan there was no secure highway. By the end of 1896, however, a new order of things had commenced. In accordance with the Durand Agreement (1893) with the Amir, which assigned the Chagai district to the British sphere, a Delimitation Commission was occupied (from 1894 to 1896) with the work of demarcating the boundary line of 800 miles between Afghanistan and Baluchistan from Domandi at the junction of the Kundar and the Gumal rivers to the Kuh-i-Malik-i-Siyah, where meet the territories of Persia, Afghanistan, and Baluchistan. This Baluch-Afghan Boundary Commission, under Captain A. H. M'Mahon, started in March 1894, reached Domandi early in April 1894, and Nushki in the end of February 1896, and terminated its work on the Persian border in June 1896. In accordance with an Anglo-Persian Agreement in 1895, a Perso-Baluch Boundary Commission, under Sir Thomas Holdich, was occupied in February and March 1896 with the delimitation of some 300 miles of border-line from Kuhak or Kohuk on the Mashkhel river to the Kuh-i-Malik-i-Siyah. Thereupon the Government of India made arrangements, in December 1896, for the opening up of a trade-route from Quetta to Sistan through Nushki.

What the trade of Sistan was like about that time may be seen in the account which Colonel C. E. Yate gives in his book on Khurasan and Sistan, from a visit which he paid as Consul-General to the Sistan district in the beginning of 1894. "As to trade," he says, "I found that there were no regular traders in Sistan at all, nor any foreigners, except a few Kainis who dealt in skins and wool. As a rule, the different villages clubbed together and sent a *kafila* to Bandar Abbas or to Quetta once a year in the autumn, returning in spring. About 3000 camel-loads were said to leave Sistan in this way annually, 500 of which went to Quetta with ghee and a little wool, and all the remainder to Bandar Abbas with wool and goatskins, bringing back in return tea, indigo, spices, sugar, and a small quantity of piece goods. The things thus brought did not as a rule come into the town bazar, but were taken by the camel *kafilas* to the villages direct. The supply was said to be generally not sufficient to last out the year, and the people had to eke out the last few months with goods from Birjand, which were mostly Russian. The Sistan bazar at Nasirabad [Nasratabad] I found absolutely empty. There was nothing in it at all but a small quantity of Russian sugar, with, curiously enough, the British arms on the label, and two packets of Belgian candles. Some 7000 camel-loads of hides, wool, and goat-skins were said to be sent to Sabzawar every year for exportation to Russia, and the imports from Russia in return were iron cooking-pots, piece goods, and sugar. Russian sugar, I found, was sold in Sistan at a little less price than it was sold in Birjand. It was curious to see

how the further it went the cheaper it got."—(*Khurasan and Sistan*, 1900, pp. 84-85.)

But the district of Sistan is not the main field of trade for which this new trade-route is designed as a highway of communication. It is chiefly Khurasan and its capital, the celebrated sacred city of Mashhad. There Anglo-Indian trade comes now into keen competition with that of Russia. Up to the year 1896-97, the British trade with Mashhad had been more important than that of Russia, but during the three preceding years the Russian imports had been steadily increasing and the British imports steadily declining. The efforts of the Russian Government to increase their trade by giving subsidies, making roads, establishing consular agencies in different districts of Khurasan, and affording other facilities to their traders, had been crowned with success. Russian merchants, encouraged by the measures taken by their Government for the purpose of improving trade, had poured into the province and started businesses in different parts throughout it: they had established centres for the purchase of wool and skins in Turbat-i-Haidari, Turbat-i-Shaikh Jam, and Birjand, and had opened depôts of sugar, kerosene oil, and cotton prints in Mashhad and Sabzawar. Thus they were pushing on their trade to all parts of Khurasan, and even as far south as Sistan, in districts far away from the Russian border and near the British frontier, where the Anglo-Indian goods should command the market.

Such was the report which Colonel Yate transmitted to the Foreign Office in 1897. He called attention to the fact that Anglo-Indian goods do not reach Eastern Persia through any British or Indian merchants, but through village shopkeepers, pilgrims, travellers, or camel-men; that British and Indian traders have no such facilities as those enjoyed by Russian traders; that they are handicapped by their goods being conveyed by long, difficult, and expensive journeys before they reach Mashhad, and, having to work under many great disadvantages, are losing ground daily.

The routes of Russian trade with Khurasan are from Gaz or Bandar-i-Gaz on the south-east shore of the Caspian Sea, through Astarabad, Shahrud, and Sabzawar to Mashhad, and from Askhabad or Ashkabad, on the Central Asia Railway, to Kuchan and Mashhad. The routes of British trade are partly through Tirabzun (Trebizond) in Anatolia, Tabriz, and Tihran to Mashhad, but mainly from the Persian Gulf port of Bandar Abbas. The caravan highways from this port to Mashhad lead mostly through either Kirman or Yazd. Major Molesworth Sykes in his report on Kirman for 1894-95 said that the main portion of the Bandar-Abbas-Khurasan trade avoided Kirman altogether, choosing the longer route through Yazd, both because of the chance of finding a market there, and because it was impossible to obtain protection by the direct road. The nearest point to Kirman struck by the caravans from Bandar Abbas was Bahrambad. The direct route from Bandar Abbas to Mashhad led through Kirman, Rawar, and Tun. It would pay, he said, to use this direct route much more extensively, as the saving in transport would be great. Its advantages, however, had been discounted

Kuchan
Mashhad-i Sar
Mahmudabad
Sari Gaz
Astarabad
Bustan
Amul
Barfurush
Shahrud
Gunabad
Mashhad
Nishapur
Sharifabad
Sabzawar
Azadabad
Turbat-i-Haidarn
Turbat-i-Shaikh Jam
Kushk
Hari Rud
HINDUKWSH
KABUL
Jalalabad
QTIHRAN
Kum
Namak-e-Kavir
Salt Swamp
Kavir of Bajistan
Khaf
Panwanak
Bajistan
Gunabad
Tun
Kakh
Kain
HERAT
Hara Rud
Kashan
Tabas
Rum
Yazdan
AFGHANISTAN
Ghazni
ISFAHAN
Nain
Birjand
Durukhsh
Sabzawar
Tabas
Anardara
Naiband
Mud
Zahn
Farah
Demandi
YEZD
KANDAHAR
Girishk
Neh
Bandan
Rawar
Palan Kuh
Nasratabad
Gardi-Chah
Sikuha
New Chaman
Chaman
PERSIA
Bahramabad
Khabis
KIRMAN
Halmand
QUETTA
Harnai
Darwaza
Hurmak
Mastung
Sibi
SHIRAZ
Robat
Gand i-Zirreh
Shelagh Hamun
MUSHKI
Saidabad
Jamal Bariz Range
Ladis
Chagai
BUSHIRE (ABU SHAHR)
Bam
Amir Chah
Merui
Kalat
Rigan
Saindak
Dalbandin
Khavar
Jacobabad
Nashkhi Hamun
Shikarpur
PERSIAN GULF
Bandar Abbas
Magas
BALUCHISTAN
Kuhak
Bampur
Rinds
INDIA
Lingar
Baila
Sunmyani
Jask
Kalmat
Gulf of Oman
Chahbar
Gwadar
Pasni
Urmara
Karachi
Gwatar

from the absence of any consular control. As a proof of the actual track by the direct route he mentioned that a wagon occasionally brought passengers and goods right through from Mashhad to Kirman without encountering any difficulties.

In 1897 Colonel Yate gave in his consular report the following account of the caravan route generally taken from Bandar Abbas to Mashhad :—

Names of Places.	Distance in Miles.	Number of Marches.
Bandar Abbas, ...	...	...
Saidabad, ...	265	11
Kirman, ...	114	5
Naiband, ...	180	11
Birjand, ...	130	5
Kain, ...	63	3
Turbat-i-Haidari, . . .	137	7
Mashhad, ...	77	4
Total, . . .	966	46

This route of 966 miles could thus be traversed in forty-six marches averaging 21 miles each, but camels take from seventy-five to ninety days, and consignments were often delayed in transit for a long time owing to—

(1) Difficulties with the customs officials at the port;
(2) Laziness of forwarding agents;
(3) Transport not being procurable always at Bandar Abbas or Kirman;
(4) Unsatisfactory arrangements with the carriers;
(5) The goods changing hands three times *en route*;
(6) Delays in getting fresh transport; and
(7) Interference and unjust demands of customs officials at intermediate stations.

It was with a view to removing all those obstacles which traders had to contend with on this and other routes to Khurasan, and in order to improve British trade, that the British Government made its arrangements in December 1896 to open a new, direct, and easy trade-route between India and Eastern Persia. The following is Colonel Yate's account of the Nushki route in 1897 :—

Names of Places.	Distance in Miles.	Number of Marches.
Quetta,	...	...
Nushki,	80	4
Dalbandin,	110	5
Amir Chah,	184	8
Kuh-i-Malik-i-Siyah,	134	7
Sihkuha,	76	4
Nasratabad or Nasirabad (Sistan),	21	1
Bandan,	50	3
Neh or Nih,	45	2
Birjand,	115	5
Kain,	63	3
Turbat-i-Haidari,	137	7
Mashhad,	77	4
Total,	1092	53

This new route through Nushki, estimated by Colonel Yate at 1092 miles from Quetta to Mashhad, could thus be traversed in 53 marches averaging 20½ miles each. The advantages of this new caravan highway, with wells dug at convenient intervals and levy-posts established at different stages all along the route to secure the safety of caravans and to facilitate their passage through the desert tracts, were considered to be that as the route passes entirely through territory which is under British control as far as the border of Sistan, the caravans would have no fear of the imposition of heavy dues by Afghan officials or of Baluch raids; that camel-grazing and wood are procurable at every stage, and grass at most, while arrangements were being made for the provision of grain also; and that cheap camel transport is available at Quetta, in Sistan, and at other places along the route. Although the distance is 126 miles longer than that of the Bandar Abbas-Kirman route, wrote Colonel Yate in 1897, yet the journey would only occupy about two months (including halts), instead of at least 75 days or three months taken by camels by the Bandar Abbas-Kirman route. Besides, the sea-voyage from Karachi to Bandar Abbas would be avoided, as well as the obstacles, troubles, and inconveniences mentioned above, which are often experienced on the Bandar Abbas-Kirman road. With proper forwarding agents at Quetta and carriers engaged for the whole journey, which could be easily arranged, the goods would come from Quetta to Mashhad without changing hands or delay in transit, as there are no customs officials to interfere with caravans. The customs official on the Sistan frontier would give passes free of charge to the carriers, and 5 per cent. *ad valorem* duty would be paid at Mashhad. The road, he added, was already showing signs of becoming very popular, and was likely to expand British-Indian trade with Sistan and Khurasan to a great extent. He

noted, moreover, that the opening of this new trade-route might help British-Indian merchants to improve their positions, provided that consular protection and other facilities were afforded them at central points on the road between Sistan and Mashhad. At that time there was no British consular agent either at Nasratabad or at Birjand, though at both places Russian consular agents had for some years been posted. In the absence of such British agents who could protect and give the necessary assistance to traders, the latter were likely to meet with many serious obstacles.

The imports of foreign goods to Mashhad from India (*viâ* Bombay and Bandar Abbas) were estimated in 1892-93 at £211,868; in 1893-94, £198,496; in 1894-95, £312,123; in 1895-96, £199,167; and in 1896-97, £89,547. The imports from Russian territory for the same years were estimated at: £80,166; £72,394; £59,208; £86,929; £92,547 respectively. The corresponding exports to India amounted to £31,314; £8,428; £6,871; £22,269; and £19,681. To Russian territory the exports amounted to £36,024; £27,750; £24,458; £67,889; £80,320. Such were the respective amounts up to the opening of this Nushki route. It may be as well to give here the amounts for 1897-98, 1898-99, and 1899-1900. The imports from India (*viâ* Bombay and Bandar Abbas) amounted to £130,282; £123,328; and £142,099 respectively. The exports to India amounted to £40,083; £37,557; and £42,466. The imports from Russian territory amounted to £121,279; £163,322; and £178,708. The exports to the same amounted to £79,453; £124,792; and £147,075.

Such was the commerce of Khurasan for which it was hoped this Nushki route would enable India the better to compete. As soon as the Baluch-Afghan Boundary Commission had terminated its work, Captain Webb-Ware, who had been one of its members, was appointed to the charge of the Chagai district, and he at once commenced to open a caravan route, an arrangement having been made with the Khan of Kalat whereby the Government of India took over the administration of the Nushki district and the border strip of desert between Quetta and Sistan. Since 1899 this Nushki district has been leased from the Khan of Kalat on a perpetual quit rent of Rs. 9000 per annum. "This small tract of Kalat territory is interposed like a wedge between the desert tracts of Chagai, through which the trade-route runs to the Persian frontier, and which are under our political control, and the Shararud pargans of the British Indian district of Pishin. The authority of the Khan over this distant corner of his dominions was very slight, the tribes were constantly at feud with each other, and with the Amir's subjects in the neighbouring district of Sharawak, and the portion of the trade-route which passed through their country was very insecure. The acquisition of this tract by the British Government was therefore of importance in the interest of the new road; it has the further advantage that it completes the belt of administered territory which now runs all along the border of Afghanistan from Domandi, on the Gumal river, to the frontier of Sistan, and practically the whole of the trade-route now lies in territory under British control."—(*Report on the Administration of the Baluchistan Agency for* 1899-1900, p. 17.)

All accounts agree in celebrating the important success which has crowned Captain Webb-Ware's energy and enterprise, and the hard work by which it has been achieved.[1] By digging wells, erecting thanas, and organising levy-posts, he has succeeded in making it a secure highway of trade between India and Persia. At Nushki a large bazar has been erected consisting of 133 shops and 109 houses; a dispensary was opened on the 4th February 1900; besides the telegraph and post-office at Nushki, branch post-offices have been opened at Dalbandin, Merui, Amir Chah, and Robat. The chief places along the route from Nushki to the Persian border are Dalbandin, Merui, Amir Chah, and Saindak. Some five miles beyond Robat the route passes into Persian territory, skirting the base of the Kuh-i-Malik-i-Siyah. Hurmak, where a Persian customs post has now been established, stands on the slope of the hills, but beyond is a desert plain. Between this point and Nasratabad, the capital of Sistan, there is a small Dak post at Gardi Chah, supported by the British Government to facilitate the carriage of letters to Birjand. Gardi Chah, says Captain Wyatt, holds an important position, as all caravans passing from India to Persia or Afghanistan must stop there, as it is the only place where water can be obtained for a considerable distance. From Nushki to Robat on the Persian border it is some 500 miles. The march from Quetta to Nushki, a distance of 96 miles, is made in seven stages by large caravans, by smaller in five. From Nushki to Robat it is a journey of eighteen marches; five to Dalbandin, three to Merui, and ten to Robat. The three marches between Saindak and Robat are on the daman or slope of the mountains. Robat is half a march from the Kuh-i-Malik-i-Siyah.

Some details regarding the route may be cited from Captain Wyatt's account. He set out from Quetta on the 19th of May 1899. Up to Nushki the road leads through the stony hills and passes of the Baluch Highlands in a comparatively cool climate, but after that he found the heat excessive, Nushki generally recording about 10° to 15 more than Sibi or Jacobabad. At Nushki, "which is developing into quite a city under Captain Webb-Ware's able management," he found that it was impossible to travel by day owing to the heat, and made arrangements to start in the evening at sunset, and to travel through the night. "A great comfort," he says, "about these parts is that a few hours after sunset the atmosphere gets quite cool and the night is pleasant; but for several stages out of Nushki the heat was tremendous during the day, far too hot to sleep, and absolutely necessary to drink a certain amount of water (usually very salt in the desert) every half hour or so, to prevent going down with heat apoplexy." On the 24th of May he arrived at Dalbandin, the road being all the way on the flat, with high,

[1] See Captain F. O. Wyatt's "The Western Glacis of India," *Proceedings of the Royal Artillery Institution* for March 1900, vol. xxvii.; Lord Ronaldshay on "The New Anglo-Persian Trade-Route" in the *Times*, 30th October 1901; Mr. Edward Penton's paper on "The New Trade-Route to Persia by Nushki and Sistan" in the *Journal of the Society of Arts*, December 20, 1901, and the *Board of Trade Journal*, 1897-1901, *passim*.

precipitous hills to the south and a plain on the north stretching away into Afghanistan. From Dalbandin to Merui, which he reached on the 26th May, he marched over some stony plains, and then over undulating plains to Amir Chah, which he reached on the 31st May. On the 3rd June he arrived at Saindak, a small post situated in the hills above the sandy desert, the road having led over shifting sandhills some 200 feet high in places. From Saindak he marched through the hills to Robat, where he arrived on the 6th of June, having taken twenty-two days to travel 500 miles.

During the last two years great progress has been made, and at each stage along the route there now exist a caravanserai, a guard, and a supply of drinkable water, while Indian traders who sell supplies at fixed rates are stationed at the more important points. A bi-weekly post runs both ways as far as Sistan, and a road, fifteen feet in width, runs from Nushki, to which point there is a metalled road.

Since the end of 1898 the Nushki-Sistan route has become increasingly a commercial success. The trade through Nushki amounted to Rs. 5,89,929 in 1897-98; Rs. 7,28,082 in 1898-99; Rs. 12,35,411 in 1899-1900. In 1900-1 it amounted to 15¼ lakhs (Rs. 15,34,452), about £103,000.

An important concession has been granted by several of the Indian railways—a rebate of one-third on all freights coming or going by the Nushki route. In April last it was announced from Ceylon that the Kangra tea-planters had decided to send a caravan of one hundred camels along the Nushki route to Persia in June or July. In his report for 1900 the vice-consul at Bandar Abbas says that there is no doubt the growing popularity of the Nushki route is telling more adversely every year on the trade of Bandar Abbas. The Birjand and Sistan caravans of four thousand and three thousand camels yearly, during 1900 deserted Bandar Abbas entirely for the first time, and it will probably be found that a good deal of the trade they represent has gone by the Nushki-Quetta route, which is secure, while the main caravan routes between Bandar Abbas and Yazd and Kirman are stated to have been more than usually unsafe during the year, and on more than one occasion the road was partially blocked for a time.

It is necessary to recognise the important work which Colonel Chenevix-Trench, the Consul-General at Mashhad, and Major Molesworth Sykes, the consul at Kirman, have both done in promoting the success of this commercial enterprise. By their efforts a consulate has been established at Nasratabad, and a consular agency at Birjand; and the Nushki-Sistan route has now been opened up by the energy and enterprise of Major Molesworth Sykes[1] to Kirman as well as to Khurasan.

It is considered, however, that the further development of this commercial highway demands improved facilities for the carriage of goods between Quetta and Nushki, and that all efforts should be directed towards making Nushki, and not Quetta, the goal of inward-bound caravans, and the starting-point of outward-bound caravans. It

[1] See his paper on Eastern Persia in *J.R.G.S.*, February 1902.

is impossible on account of the climate for camels to remain at Quetta for any length of time, and when large caravans make a halt of any duration the camels have to be sent either to Nushki or to Sibi. This disadvantage increases considerably the cost of freight. It is therefore proposed to make a railway from Quetta to Nushki, and a survey of the route has been made. Whether this line of railway has been sanctioned or not, as reported, it may not be inopportune to recollect that Colonel Mark Bell has proposed, from military considerations, that a road should lead from Darwaza at the head of the Bolan to Nushki, and that Lord Curzon has spoken of this same route as a feasible line for a railway to follow.

Although it is beyond the scope of this article to discuss the feasibility of this railway from Quetta to Nushki and the Sistan border, it may be permitted me to refer to an article on an Indo-European Highway which appeared with a map in this *Magazine* for September 1900, and to say that, according to a note which the editor received from Colonel Mark Bell, the route which he would propose from Nushki to Sistan was not quite correctly shown on that map, as he would make it dip down south through Kharan and the Mashkhel river country, so as to develop Baluchistan, which is one of the best camel-rearing countries in the world, and much of which is capable of well irrigation, if Indian colonies were planted.

PROPOSED NATIONAL INSTITUTE OF GEOGRAPHY.

The Editor, Scottish Geographical Magazine.

EDINBURGH, 12*th March* 1902.

DEAR SIR,—With reference to Mr. Bartholomew's "Plea for a National Institute of Geography," and to my "Draft Plan" and "Note," published in your last issue, the accompanying selection of letters may be of interest.—Yours faithfully, P. GEDDES.

From the RIGHT HON. JAMES BRYCE, M.P., D.C.L., F.R.S.

I have read your paper with much interest and sympathy. Beyond the expression of hearty goodwill for the scheme of a Geographical Institute, as outlined by yourself and Mr. Bartholomew, I have little or nothing to say. The idea of an Institute of Geography, which shall cover Geography in its three leading aspects, Physical, Historical, and Economic, seems to me an admirable one. The scenic element ought also to be regarded. The combination of graphical presentments, with a store of knowledge accumulated in a complete library, ought to be most serviceable not merely educationally, but also to advanced students on the one hand, and to practical men, such as engineers, merchants, and financiers, on the other. An Outlook Tower, like that which you have

at Edinburgh, would be of great interest. It would seem to bring facts into new relations and stimulate reflection.

As respects the plan of the building, I like the globes and the general arrangement. I hope ample provision will be made for illustrating the history of geography, *i.e.* of geographical discovery, a side of history seldom sufficiently dwelt upon. The elevation is a little too much in the Exhibition or winter garden style. I should prefer something rather less regular, not only more artistic, but more historically symbolic, if this were not too costly. —Yours very truly, JAMES BRYCE.

From SIR CLEMENTS MARKHAM, K.C.B., F.R.S., President R.G.S.

Your own ideas and your efforts to give them practical shape have always interested me very much, and I have long had my own castles in the air on the subject of a central geographical society in close relation with many branches. I hoped, and still hope, that there may be valuable results from the scheme which M. Reclus put before us, and from others who are working on similar lines.

But how the plans of yourself and Mr. Bartholomew are to be realised, taking into consideration the vast sum that will be required, and the amount of organising ability that must be brought together, is the question for practical consideration. The nucleus, and a very considerable nucleus, exists in London, in the Royal Geographical Society. Here there is the finest geographical library in the world, which it has taken seventy years to collect. It consists of 40,000 volumes, and there is not only an alphabetical catalogue, but also a classified catalogue, by means of which a student can at once obtain information respecting what has been written on any geographical subject whether in published books and pamphlets or in periodicals. The library is increased at the rate of 750 volumes a year. The history of geographical discovery is now fully provided for by the Hakluyt Society, which is more or less affiliated. The map-room of the Royal Geographical Society is a public institution, receiving an annual government grant of £500. The map collection consists of 102,000 sheets of maps, to which has been added, since 1884, upwards of 20,000 photographs and slides. The Government Departments can at any moment, and indeed do, turn to the Royal Geographical Society library and map-room, and thus obtain the latest and most reliable facts about the obscurest tracts on the face of the earth, over which an international dispute may arise.

Here then is the main foundation upon which the more complete edifice conceived by Mr. Bartholomew may be erected. A site, sufficient space, and the necessary funds have to be found. There must be much more ample space for the library and map collection, as well as for a geographical museum, and for other arrangements, including the tower of regional survey, and, if possible, the globes. The subject will begin to receive the serious attention of the Council of the Royal Geographical Society in a year or two, when Mr. Bartholomew, yourself, and other leading geographers will no doubt be invited to meet and thus form a more representative deliberative council. The principal question to

solve will at first be financial, but I believe that there will be no insuperable difficulty in realising the great national scheme which has been sketched out by Mr. Bartholomew and yourself.—Ever yours sincerely,

CLEMENTS R. MARKHAM.

From SIR ARCHIBALD GEIKIE, D.C.L., F.R.S.

Your scheme is an ambitious one, but if funds be forthcoming, not, I think, impracticable. There can be no doubt that we Britons, as far as concerns our relations to our fellow-men and the development of our knowledge of the earth we inhabit, are a hand-to-mouth race. We have managed somehow to "muddle through," as the phrase goes, and pride ourselves on our success. But this success was gained before other countries had waked up to take a lively interest in affairs outside their own domains, and especially to enter as competitors with us in the commerce of the world. They have realised that to rival us, and if possible to oust us from our leading position, they must avail themselves of every kind of knowledge, technical, scientific, and geographical. And there can be no doubt that some of them have outstripped us in these respects, and that they are becoming every year more formidable rivals. Whatever, therefore, can be done to enlighten us regarding the world outside should be done promptly and effectively. Such an Institute of Geography as you and Mr. Bartholomew suggest would make an excellent centre if it were carried out in a simple and methodical way, not too ambitiously at first. The lines should be broad and comprehensive, but the details could only be satisfactorily filled in by degrees as practical experience showed in which direction they could be best supplied. The Imperial Institute, you may expect, will be quoted as a warning to you against embarking on another grandiose scheme. Mr. Bartholomew suggests that the Imperial Institute might be successfully worked by an Imperial Geographical Society. Whether this is a practicable idea remains to be seen. Certainly the Imperial Institute, in its original scheme, was in large measure meant to do for the whole British Empire, and in a less degree for other countries, what you propose in the applied part of your design. It would probably be difficult or impossible to have two institutes covering much of the same ground. In one important respect the Geographical Institute, as proposed, would stand distinct. It would have, I understand, a scientific basis. The commercial aspects would necessarily demand the fullest consideration, but they would spring from well-grounded scientific acquirement. Anything of the nature of a mere bazaar or universal exhibition of the wares of all countries, exposed for sale by competing firms, would of course end deservedly in ultimate failure.

But if the geographer or man of science could find, in some great central institution, all available information as to the climate, scenery, geological structure, productions, and people of all quarters of the globe; if in the same building the manufacturer, engineer, and merchant could learn all that he desired to know about other countries and races, and would find suggestions as to new outlets or the way of improving old

avenues for industry and advancement; and if our legislators, who are not always as well informed as we could wish, could at any moment turn to the same centre and obtain at once the latest and most reliable facts about the obscurest tract on the surface of this earth, over which perhaps international disputes might easily arise, surely the foundation of such an institute would be acknowledged to have been amply justified. So I wish all success to the enterprise.—Yours very truly,

ARCHIBALD GEIKIE.

PROCEEDINGS OF THE ROYAL SCOTTISH GEOGRAPHICAL SOCIETY.

MEETINGS IN MARCH.

On the 13th March Professor Edmund J. Garwood, M.A., etc., delivered a lecture to the Society in Edinburgh on "The Peaks and Glaciers of the Sikkim Himalaya." The lecture was illustrated by a magnificent series of lantern slides. The Chair was taken by Sir John Murray, President of the Society.

Professor Garwood repeated his address to the Dundee Branch on the 14th March, when the Rev. Colin Campbell, D.D., presided.

On the 18th March, Professor Wm. M. Ramsay addressed the Aberdeen Branch on "The Geographical Conditions Determining History and Religion in Asia Minor."

SCOTTISH ANTARCTIC EXPEDITION.

A donation of £3, 3s. has been received from Dr. H. R. Mill for the funds of the Scottish Antarctic Expedition.

MEETING OF COUNCIL ON 17TH MARCH.

The following ladies and gentlemen were elected Members of the Society:—Miss J. Edith Macgeorge, Miss M. J. Ewing Smith, A. L. Cross, R. E. Corrie, David Hunter, Alexander Reid, Captain J. Cunningham, James D. M'Laurin, John George Musgrave, John W. Johnston, Andrew Gray Lumgair, Alexander Macdonald, James Gray Flowerdew Lowson, Ph.D., Captain Harry Walker.

Dr. James Burgess, C.I.E., LL.D., was appointed to represent the Society as its delegate at the Congress of Orientalists to be held in Hamburg in September.

NEW BOOKS.

Western Mediterranean (Macmillan's Guides). With Maps and Plans. London: Macmillan and Co. Pp. xxvi + 238. *Price 9s. net.*

Eastern Mediterranean (Macmillan's Guides). With Maps and Plans. London: Macmillan and Co. Pp. xxviii + 245. *Price 9s. net.*

Palestine and Egypt (Macmillan's Guides). With Maps and Plans. London: Macmillan and Co. Pp. xix + 270. *Price* 10*s. net.*

Our previous criticism of this new series of guides applies equally to the above volumes. The descriptions and information are limited to the more important features, evidently with object of meeting the requirements of the general crowd of tourists who do not want the fuller detail given in *Baedeker* and *Murray*. The guides bear every evidence of having been edited by an experienced traveller and are eminently practical. With the exception of the much overcrowded map of Palestine, the maps and plans in these later volumes are a decided improvement on those in the Guide to Italy.

Egypt: Handbook for Travellers. By K. Baedeker. With 23 Maps, 66 Plans, and 59 Vignettes. Fifth remodelled edition. London: Dulau and Co. Pp. cxcii + 408. *Price* 15*s.*

Baedeker has hitherto treated Egypt in two volumes, *Lower Egypt* and *Upper Egypt*. Now, with some condensation, he combines them in one. This is a distinct advantage, as most visitors to Lower Egypt wish to make at least an excursion up the river. In addition to general systematic revision, several new plans have been added, and altogether the handbook is most complete and compact.

Hazell's Annual for 1902. London: Hazell, Watson, and Viney, 1902. Pp. 732. *Price* 3*s.* 6*d.*

Each year this Annual shows in the language of the biologists, more specialisation and more differentiation. Among the new features of the present volume are new maps of the North-West Frontier of India, of the Balkan Peninsula, and of the projected Isthmian Canal routes in Central America, new articles on the Triple Alliance, the inauguration of the Australian Commonwealth, the war in South Africa, and events in West Africa, and other subjects of current interest. The articles on Foreign Countries have been modified and improved, in addition to being brought thoroughly up to date. In brief, the Annual is now more than ever indispensable to all those who require a thoroughly satisfactory book of reference in regard to current affairs.

Almanack for the Year of Our Lord 1902. By Joseph Whitaker, F.S.A. London, 1902. Pp. 776. *Price* 2*s.* 6*d.*

The current issue of this useful Almanack has been thoroughly brought up to date, and contains several new articles on such subjects as the Census of 1901, the Australian Commonwealth, Old Age Pensions, Submarine Boats, and so on. The Almanack, in its present issue, sustains its well-merited reputation.

Among the other Annuals, Year-Books, etc., which have reached us are the following:—

Official Year-Book of the Scientific and Learned Societies. London: Griffen and Co., 1901. Pp. 347. *Price* 7*s.* 6*d.*

The Guide to South Africa, 1901-1902 edition. London: Sampson Low, Marston, and Co.; and Juta and Co., Cape Town, Port Elizabeth, and Johannesburg, 1901. Pp. 475. *Price* 2*s.* 6*d.*

Both of these contain a large amount of information in regard to their special subjects.

Dizionario dei Communi del Regno d'Italia, secondo il censimento del 10 *febbraio* 1901. Ulrico Hoepli, Milano, 1902. A compact and useful little volume.

Bibliotheca Geographica, Jahrgang 1898. Bearbeitet von Otto Baschin, Kühl, Berlin, 1901. A book whose usefulness to geographical students can hardly be overestimated.

We have also received the first issue of *Lochhead's Bloemfontein Directory.* Orange River Colony General Agency, Bloemfontein, O.R.C., 1901. Pp. 227.

We are requested by Mr. T. Fisher Unwin to correct the statement made in our last issue that *Wales* is the last volume of the "Story of the Nations" Series. A number of other volumes are to appear in the series, including the following which are in preparation :—*Mediæval Rome*, by W. Millar ; *The Papal Monarchy*, by Dr. Barry ; *Buddhist India*, by Rhys Davids.

NEW MAPS.

EUROPE.

ORDNANCE SURVEY OF SCOTLAND.—The following publications were issued from 1st to 31st January 1902 :—Parish Maps (Scale 1 : 2500, Revised, with Houses ruled, and with areas. Price 3s. each). *Aberdeenshire.*—Sheets XII. 9 ; XIII. 5, 9, 10, 11, 14, 15, 16 ; XV. 1 ; XVIII. 13, 14 ; XXI. 2, 3, 4 ; XXII. 1, 2, 3 ; XXVII. 1 ; XXXIII. 16 ; XLII. 2, 3 ; LII. 13 ; LXII. 1, 5, 9, 10, 13 ; LXX. 9, 13 ; LXXI. 1, 5, 13 ; LXXV. 11 ; LXXXI. 1, 14 ; LXXXII. 1. 9, 13 ; LXXXIX. 14 ; XC. 10, 13 ; XCII. 1, 2, 4, 5, 6, 8 ; XCIII. 1 ; XCVII. 8. *Banffshire.*—Sheets XXXV. 8, 12, 16 ; XXXVI. 14 ; XLI. 5, 6. *Forfarshire.*—Sheets XLII. 11 ; XLIX. 14, 15. *Inverness-shire.*—Sheets XLVI. 3, 4, 12 ; XLVI*a*. 5. *Orkney.*—Sheets LXXXI. 8, 10, 11, 12 ; LXXXIV. 16 ; LXXXV. 9, 11, 14, 15, 16 ; LXXXVI. 2, 7, 10, 12, 14, 15, 16 ; LXXXVII. 1, 2, 6 ; LXXXVIII. 8, 11 ; XCI. 3, 4, 7, 8 ; XCII. 4, 8, 14 ; XCIII. 13. *Perthshire.*—Sheets LIV. 14 ; LXXXVIII. 2.

Note.—There is no coloured edition of these Sheets, and the unrevised impressions are withdrawn from sale.

One-inch Parish Indexes, printed in colours in two forms, one showing the 1 : 2500 Scale Maps, and the other the six-inch sheets. Sheet 128, Price 1s. 6d.

Six-inch County Maps, Revised, Engraved. Price 2s. *Aberdeenshire.*—Sheet 111.

Six-inch Maps (Quarter Sheets—Revised). *Aberdeenshire.*—92 SW. ; 101 NW., 101 NE. (Price 1s. each). *Perthshire.*—24 NE. ; 99 NE. ; 110 NW. (Price 1s. each). With contours, Price 1s. each—*Perthshire.*—43 SW. ; 64 (NE. and SE.) ; 75 SE. ; 98 SE.

The following publications were issued from 1st to 28th February 1902 :—Parish Maps (Scale 1:2500, Revised, with Houses ruled, and with areas. Price 3s. each). *Aberdeenshire.*—Sheets XIII. 1, 2, 3, 6, 8, 12 ; XVII. 6, 7, 8, 10, 12, 13, 15, 16 ; XVIII. 5, 9 ; XXV. 1, 2, 3, 4 ; XXVI. 1, 2, 3, 4 ; LI. 13 ; LXXI. 9 ; LXXXII. 5 ; XCII. 3. *Banffshire.*—Sheet XXXVI. 13. *Forfarshire.*—Sheets LIII. 2, 6. *Orkney.* —Sheets LXXXIV. 12 ; LXXXV. 13 ; LXXXVIII. 7, 10, 12, 14, 15, 16 ; LXXXIX. 4, 5, 6, 9, 13 ; XCII. 2, 3, 6, 7 (11 and 12), 15, 16 ; XCVIII. 2, 3, 4, 8 ; XCIX. 1, 5.

Note.—There is no coloured edition of these Sheets, and the unrevised impressions are withdrawn from sale.

Six-inch Maps (Quarter Sheets, Revised). *Aberdeenshire.*—101 SW. Price 1s. With contours, price 1s. each—*Aberdeenshire.*—20 NW. ; 25 SE. ; 26 SW. ; 34 NW. ; 42 SW. ; 52 NW. ; 66 SE. *Banffshire.*—38 SW. *Perthshire.*—64 SW.

Catalogue of the Ordnance Survey Publications of Scotland, revised and corrected to the 1st January 1901. This is the last edition issued ; but a new edition is in progress.

GEOLOGICAL SURVEY, SCOTLAND.—One-inch Scale.—Sheet 21. Price 4s.

WÜRMSEE, Atlas der ——, (Starnbergersee) in Ober-Bayern. Eine limnologische Studie von Willi Ule. Herausgegeben mit Unterstützung des Vereins für Erdkunde und der Carl Ritter-Stiftung zu Leipzig. 8 Tafeln. 1901.

Verlag von Duncker und Humblot, Leipzig.

This atlas, with the accompanying volume of text, constitutes a valuable contribution to limnological research. It consists of four maps dealing with the bathymetrical survey of the lake, the geology and geomorphology of the district. Also diagrams and curves illustrating depth temperatures, rainfall and changes in lake levels. The text, with its illustrations, is elaborate and exhaustive. In fact, Dr. Willi Ule has treated the Würmsee on the lines of Sir John Murray's survey of the Scottish Lochs.

ENGLAND AND WALES. Bartholomew's Reduced Ordnance Survey. Scale 2 miles to an inch. Sheet 4, Durham. Sheet 19, Huntingdon and Cambridge. With Roads specially revised by the Cyclists' Touring Club. *Price* 1*s. each. Mounted on cloth* 2*s.*

John Bartholomew and Co., Edinburgh.

ENGLISH LAKE DISTRICT. Reduced Survey Map on scale of one mile to an inch. By John Bartholomew, F.R.G.S. With orographical colouring. *Northern Sheet*—Keswick, Grasmere, etc. *Southern Sheet*—Windermere and Morecambe Bay. *Price* 1*s. each. Mounted on cloth* 2*s.*

John Bartholomew and Co., Edinburgh.

AFRICA.

EGYPTIAN SUDAN. War Office Map of Africa. Scale 1 : 250,000, or about four miles to an inch. 1902. *District Sheets*—Salmia, Lower Omo, Roseires, Mount Lubur. Reproduced from Maps supplied by the Director of Sudan Surveys. *Price* 1*s.* 6*d. each.*

Intelligence Division, War Office.

There is issued with the above new sheets a general index-map of the Egyptian Sudan Survey showing the progress of publication to date. Of the 244 sheets shown in the index-map 29 are now published.

ASIA.

INDIA. Maps published under the direction of Col. H. R. Thuillier, R.E., Surveyor-General of India :—

Railway Map of ——. Scale 1 : 2,027,520. In six sheets. 1901.

Railway Map of ——. Scale 1 : 3,041,280. In four sheets. 1901.

Railway Map of ——. Scale 1 : 5,068,800. In one sheet. 1901.

Atlas of India. Scale about 4 miles to an inch. Large Sheets—40, additions to 1896 ; 54, additions to 1899 ; 65, 80, additions to 1900. Quarter Sheets—9 SW., 23 NW., 69 SW., additions to 1897 ; 31 NE., additions to 1898 ; 39 NW., 59 SW., 72 SW., additions to 1899 ; 27 NE., 51 NE., 69 NW., additions to 1900 ; 78 NW., additions to 1901.

Atlas of India. Scale 8 miles to an inch. Sheets 12, 13, Eastern Bengal. 1900.
Berar and Hyderabad. Scale 1 : 506,880. Additions to 1896.
Central India Agency. Scale 1 : 5,068,800. 1900.
Central Provinces. Scale 1 : 2,027, 520. Additions to 1899.
Mysore. Scale 1 : 1,013,760. Additions to 1900.
Rajputana Agency. Scale 1 : 1,013,760. Second edition in 2 sheets. 1900.
Survey of India Office, Calcutta.

CHINA. "China Field Force Maps" :—
Chekiang Province, from Chinese Map. Scale 14 miles to an inch. 1900.
Chinkiang, showing position of walled camps. Scale 1 inch to mile. 1900.
Chien T'ang River, from Hang-Chou to Ch'ü-Chou. Scale 2 miles to inch. 1901.
Han River, between Han-Kou and Siang-Yang. Scale 5 miles to inch. 1899.
Ssü-Ch'uan, Central and Eastern. Scale 12 miles to inch. 1901.
Honan Province, Route from Wei Hui Fu to Pai Po Kau. Scale 2 miles to inch. 1901.
Intelligence Branch Quarter-Master Gen. Dep. in India, Simla.

NEW ATLASES.

STIELER'S HAND-ATLAS. Neue, neunte Lieferungs-Ausgabe von ——. 100 Karten in Kupferstich in 50 Lieferungen. Lieferung 3. Nr. 14, Schweiz. Nr. 40, Niederlande und Belgien. *Price* 60 *Pfennig per part.*
Justus Perthes, Gotha.

THE TWENTIETH CENTURY CITIZEN'S ATLAS, containing 156 pages of Maps and Plans, with an Index, a Gazetteer and Geographical Statistics. Edited by J. G. Bartholomew. In 26 parts. Parts 9, 10, 11, 12. *Price* 6*d. each.*
George Newnes, Limited, London.

L'ANNÉE CARTOGRAPHIQUE. Supplément annuel à toutes les publications de Géographie et de Cartographie. Dressé et rédigé sous la direction de F. Schrader. Onzième supplément, 1902. Contenant les modifications géographiques et politiques des années 1899-1900. *Price* 3 *francs.*
Librairie Hachette et Cie, Paris.

This is the eleventh issue of Monsieur Schrader's most useful and authoritative cartographic annual. It is only to be regretted that, being published in 1902, it should not illustrate the geographical and political changes for the year 1901.

THE INTERNATIONAL STUDENT'S ATLAS of Modern Geography. A series of 105 Physical, Political, and Statistical Maps, compiled from British and Foreign Surveys, and the latest results of international research, under the direction of J. G. Bartholomew, F.R.S.E. With Index. *Royal* 4*to, cloth,* 6*s. net.*
George Newnes, Limited, London.

A new and comprehensive educational Atlas, with many original features well worthy of the attention of teachers of geography.

EUROPE, Historical Atlas of Modern ——, from the decline of the Roman Empire. Edited by Reginald Lane Poole, M.A., Ph.D. Part XXVIII. containing Map 42, The Growth of Prussia. Map 66, Italy 1167-1250. Map 83, India under Mohammadan Rule. *Price* 3*s.* 6*d. net.*
The Clarendon Press, Oxford.

THE SCOTTISH GEOGRAPHICAL MAGAZINE.

BOTANICAL GEOGRAPHY AND THE BIOLOGICAL UTILISATION OF THE SOIL.

By Marcel Hardy.

I.

For several years the most authoritative economists and agriculturalists have proclaimed the urgent necessity of improving the biological utilisation of the soil upon essentially geographical grounds. In order to permit the realisation of this ideal, it was necessary to seek to establish and to define the relations between the totality of the physiographical conditions and the vegetation. That is the end which botanical geography proposes to itself. The fundamental conception of this science is not new; to the Danish botanist, Warming, belongs the honour of having defined and endowed it with activity (1896). The science once founded, it was a question of creating methods of research and of representation. Recent progress in this direction has been such that it is possible henceforth to draw deductions of practical value. The relations of cause and effect between the totality of the physical conditions of a place and the totality of its plant-life manifest themselves in two ways: 1st, by modifying the structure of the plants and progressively accentuating certain characteristics; 2nd, by grouping together plants of homologous or complementary structure. This action of the physical environment, uninterrupted in the course of the ages, has subordinated biological evolution to the evolution of the physical conditions.

The grouping of plants with homologous or complementary structure, and the modification of the structure by the environment, may be considered either in their historical aspect or in their present condition. To palæontology belongs the study of the ecological relations in the past; botanical geography deals with their manifestations in the present.

These two modes of considering the same facts are complementary. The analysis of the actual phenomena helps very much in the interpretation of the remnants of the past; and it would be impossible to understand the present without a knowledge of the former conditions. This mutual assistance is as manifest between geology and physical geography as between palæontology and phytogeography.

It is important to draw a clear distinction between the flora and the vegetation. "The flora is the total number of the species considered from the point of view of their systematic relations. The vegetation is the totality of the plant life considered in its relations to the environment, climate, soil, living beings, man included" (4).[1] "Floristic botany investigates the origin, the migrations, and the present and former distribution of the species which inhabit a given space" (2). Botanical geography which studies the vegetation we have already defined.

The results and the methods of floristic botany are, however, indispensable to botanical geography, so true is it that between no two of the natural sciences is it possible to establish an absolute line of demarcation. Since botanists, following the advice of Alph. De Candolle, have taken care to note for each species the exact station and the distribution in the area of extension, they have created for botanical geography a documentary basis of inestimable value. Their analytical studies, applying to the past as well as to the present, permit to the geographer that rigorous verification which is the foundation of all synthesis.

Since the idea of the grouping of biological forms, which is the basis of phytogeography, has been the object of definitions more and more precise, it is desirable to give to it a formula as general and as exact as the critical analysis of the facts and the interpretations proposed with regard to them will allow.

"A plant association is a spontaneous, specific grouping, a natural peopling, in which the specific units are generally strangers to one another, simply living side by side each with its own exclusive interest for object, but in which very different biological forms may find themselves brought together and in a certain measure subordinated to one another, according to the conformity or diversity of wants which find their satisfaction either in the conditions of the environment itself or in the conditions determined by the presence of other plants (14)." This conception is rather complex, and implies several subordinate notions. First of all it implies the grouping of homologous biological forms, or in other words, of plants with adaptations of the same sort, tending towards the same end. For example, in the salt marshes, *Suæda*, *Salicornia*, *Atriplex*, etc.; in the deciduous forests of the North, *Quercus robur*, *Fagus sylvatica*, *Carpinus betulus*, *Acer campestre*. To these plants we may add others which find their most favourable or exclusive stations in conditions determined by the presence of the first. Thus we find in oak or beech forests, undergrowths, lianas, epiphytes or shade-plants, such as *Convallaria majalis*, *Polygonatum vulgare*, *Asperula odorata*, *Neottia nidus avis*, and others.

[1] Figures refer to bibliography at end of paper.

Finally—and this has a great practical importance on account of the action of man on nature—there are among plants of homologous structure certain species which, owing to their stature or some other cause, are rendered subordinate in their primitive condition. As soon as their dominant partners are destroyed or reduced in number, these plants, which we may call *substitutes*, come to play a principal *rôle* and to people immense areas almost exclusively. Such are : *Calluna vulgaris*, *Vaccinium myrtillus*, *Sarothamnus scoparius*.

From these three series of plants we can draw indications which are very valuable in the reconstruction of spontaneous nature.

It would seem logical that an association should present a great homogeneity of aspect, arising from the similarity of adaptation to general analogous conditions. This cannot fail to be so to a certain extent. And yet the examination, even of associations of an inferior order which are the most concrete and the most homogeneous, offers such a variety of homologous forms, that it is sometimes very difficult to draw a synthesis, because in nature the same effect may be realised in very different ways. The adaptations are of very different date and value. Consequently we are far from possessing the key to the numerous problems which present themselves. We should be helpless without plant palæontology, which combines its results with those of ecology. From these considerations it is easy to see that the principle of the grouping of biological forms is not susceptible of a mathematical or unilateral interpretation.

But, with this reserve, we may take advantage of these conceptions in order to define the different physical environments. For, by tracing the area of extension of a given plant association, we are certain to trace, by this act itself, the territorial limits of a determined physical environment. This environment, and the corresponding association, will be symbolically named after some characteristic feature, predominant plant, nature of the soil, etc. And in the same manner as the environments subdivide and subordinate themselves in accordance with the number and the importance of the factors which constitute them, the plant groupings will arrange themselves in their turn in a corresponding hierarchy. The superior territorial units constituted exclusively by the climatic factor coincide with the climatic areas. It is in this manner that the geographer Köppen has been able to draw a map of the principal climates, which is at the same time a map of the superior units or great phytogeographical regions (12). But where the influence of the soil comes into action, it is necessary to make an appeal to the plant associations, in order to define the resultant of the two factors and the topographical limits in which these resultants predominate. It is, in fact, the only means we have at our disposal. From the fact that to each of the territorial divisions thus obtained, and to each of the correlated associations corresponds a combination of conditions of climate and soil, we easily deduce the application of botanical geography to the biological utilisation of the soil. We have learned, in fact, by observation and experience, the most favourable conditions for the culture of the principal plants utilised by man. By comparing these data with the conditions

revealed by botanical geography for a given territory, we shall determine what is the nature of the vegetation, and what is the mode of culture most suitable to the different parts of this territory. We shall succeed in this manner in getting from the soil the largest yield compatible with the preservation of its resources.

In spite of the recent date of their conception, and the small number of applications which have been made of them, the cartographical methods of phytogeography have acquired a fair degree of precision. Inspired by the ideas which Prof. Ch. Flahault conceived and developed in 1894, and which he has applied with success to the survey of a great part of France, the young Scotch botanist, Robert Smith, had commenced the survey of his native land, when death interrupted his labours (15, 16). He had been able to publish for certain districts maps which pointed out the deficiencies of the nomenclature and graphical methods. The criticisms and efforts of a certain number of geographers and botanists bring about every day improvements in this direction.

II.

Each day also affirms the urgent necessity of freeing the utilisation of the soil from the rudimentary methods which have been employed up to the present, in order to arrive at a much greater yield by avoiding an enormous waste of energy in all its forms. The economical problems present themselves with more intensity than ever before and under very diverse aspects.

There is, on the one hand, an increase of population, a greater number of mouths to feed and of hands to keep busy. At the same time and in proportion as civilisation exercises a more effective and more general influence, man's desires become greater—he feels the need of producing more with less effort. Finally, competition grows keener day by day between all the producing countries. The result is to shut out from certain branches those countries which produce under more onerous conditions, whether by reason of unfavourable natural circumstances or by reason of the employment of antiquated methods. Modern facility of communication relieves each region from the necessity of itself producing all the objects which it consumes, and at the same time compels it to devote itself to the pursuits most favoured by its physical conditions.

It is interesting to compare, by contrast, what has been the action of man on his surroundings. From this point of view the majority of the countries bordering on the Mediterranean furnish the most striking examples (3). That these regions, formerly covered with forests, have been ravaged in utter disregard of natural laws, has been many times demonstrated. We know that this is the result of short-sighted clearings, of an ignorant and mischievous treatment of the forests, and of the excessive pasturing of sheep and goats. This blow at the equilibrium of nature could not remain unpunished. The first consequence has been the disappearance of one of the most important resources of the country, of an object of the first necessity—the wood. At the same time, agriculture has been stricken in one of its fundamental elements; for the

waters, instead of the more or less abundant and regular flow which they might have had, have become quite intermittent and temporary, but at the same time torrential and destructive. Now the soil, formerly held together on the slopes by the vegetation, is dried up by the sun and washed away by the rains. Freshets have become frequent and destructive in consequence of the enormous quantities of materials worn away from the mountains with which the rivers and streams are charged. The climate itself has acquired an extreme and irregular character. Thus have been formed those immense unproductive stretches which, in certain parts, give to these unhappy regions the aspect of a desert.

The Alps and the Pyrenees, exposed to the same treatment, have been similarly affected. The deforestation paralyses the development of the pastoral industries in these regions by lowering the limits of forest vegetation. The valleys are ravaged by a devastating erosion. Entire mountains slide down slowly, carrying with them the pastoral villages which they bear on their surface, accumulating ruin and disaster. The human habitation is little by little driven back towards the plain (2).

These processes do not affect the mountains alone. For, by the very fact of this deforestation, the rich plains of the Garonne and the Loire are subjected to disastrous floods which make the fate of agriculture in these regions extremely precarious. This state of things has not failed to arouse apprehension among the inhabitants. Researches with regard to the question have shown that the devastating character of these inundations is due to the destruction of the forests which formerly covered the central plateau and the Pyrenees. The waters, no longer absorbed and regulated by the forest vegetation, flow away on the surface in enormous and sudden waves. The debris thus carried away in vast quantities contributes to the formation of barriers and give to the waters their destructive power.

But the danger does not cease there. The navigation of the great rivers gradually silted up by this waste from the mountains is rendered very difficult. So much is this the case that even Russia, a country so uniformly flat, is threatened in the use of its great waterway, the Volga. The investigations ordered by the Russian Government have demonstrated that this is the result of the drainage of the marshes and the deforestation of the low hills which give birth to the river. In other parts of the country similar effects are observed. Woeikoff further cites numerous examples of the power which erosion may acquire in the Russian plains, in consequence of an improper treatment of the soil (19).

To come to our own countries of north-western Europe, what shall we say of Scotland itself? The utilisation of the soil there has been bad from the first. Deforestation has long since finished its work. Forests, properly speaking, exist no longer. Heather-moors, peat-bogs, neglected pastures, and deer forests cover the whole tract of country to the north of the Highland border. Forest industries do not exist. The lack of wood prevents pastoral industries. Flocks from which their owners derive but little profit hinder all spontaneous reproduction of the forests. Even the numerous industries which might make use of the motive power of the waterfalls of the country would be compelled to

have recourse to foreign lands for the timber which is indispensable to them. The country continues to grow poorer; the ruins accumulate; the young population emigrates to the cities or to the colonies on account of the impossibility of finding employment and earning a livelihood on the spot. The rural population, represented by the miserable crofters, seems to have been smitten by a complete arrest of development (10).

This is certainly a typical example of that disregard of physiographical data which carries with it its own punishment.

Should such a state of things be allowed to continue? The negative is the only possible answer.

Now, have we the means of obtaining a superior yield from the soil, and of correcting the faults which we have committed? Science replies in the affirmative, and offers clear and practical means of retrieving our position. The attempts made in accordance with her directions have been crowned with success.

It is essentially a question of returning to the observation of nature. We must analyse, in the light of the conditions of climate and soil, the possibilities of each country and of each natural region of the country. We must apply the fruitful law of the division of labour.

"Let each one of our natural regions make a specialty, therefore, of the kind of produce best adapted to its natural conditions of soil and climate or to its economical surroundings. Specialisation will permit it to produce in a better manner and at a lower cost. Agriculturalists might combine for that purpose. They might, above all, organise themselves for the sale of the specialty of their region, and this, we cannot too often repeat, is the fundamental point to-day.

"It remains to clearly distinguish what are the natural conditions of climate and soil, what are the economical conditions as to means of transport, and what are the facilities of communication and the markets of each country. That is precisely one of the purposes of geography" (11).

We have seen how botanical geography more especially endeavours to define the natural regions and their subdivisions characterised by the combination of the physiographical conditions, and to fix their boundaries by the aid of the plant associations. This science is in a position to perform henceforth the large amount of labour which such an exploration presupposes. Grisebach, Drude, Supan, and more recently Köppen, have produced general maps more and more satisfactory. It is desirable, however, to keep them up to date as the climatic and geological data become more precise.

As for the detailed maps, there exists a certain number which are quite conclusive. Professor Flahault published, several months since, a botanical map of France in the scale of 1 : 3,000,000 in which subdivisions of a certain order already find their place (5).

It is several years, however, since the same savant resolved the problem of botanical cartography on a large scale, and applied his methods to the construction of maps of a large part of France, on the scale of 1 : 200,000. And the parts thus mapped are precisely those (10) in which the application of these methods meets the greatest practical difficulties, namely,

a part of the Alps and of the Pyrenees. Of this unique collection a single sheet, that of Perpignan, was published in the *Annales de Géographie* of the year 1897 (6). Let us mention, finally, that Robert Smith published in 1898 a map of the basin of the Tay in the scale of 1 : 126,720 (7). The young botanist exposed his views in a series of articles of remarkable clearness and method. But, owing to the rapidity with which botanical geography is developing, the map of the Edinburgh district published two years later shows already a real progress. Since then, criticism keeping pace with experiment, many questions of principle and many points of practice have been elucidated. Ere long the vitality and the necessity of phytogeography will be reasserted by attempts on a larger scale.

It is within the framework thus built up of botano-geographical maps that the geological map is called upon to play its *rôle*, because, for a limited area, the climatic factor remains constant ; the soil alone varies. A few years only have elapsed since agriculturalists agreed in thinking that the agricultural map was but a slight variation of the geological map on a large scale. It is now evident that this formula must be rejected as too narrow, save in certain exceptional cases.

III.

Since we have insisted on the question of the forests, it is fitting to show that this question is of the first importance in Scotland, and to explain how botano-geography intends to solve the problem. We have here the most striking example of the necessity of applying scientific methods to agricultural economy.

In the first place, the world production of timber is absolutely insufficient. This conclusion results from the examination of the customs statistics of the principal countries (13). We see, in fact, that the imports exceed the exports in England, in Germany, in Belgium, in Holland, in Switzerland, in Denmark, in France, in Spain, in Portugal, in Italy, in Greece, in Servia, and in Turkey. Such countries as the United Kingdom, Germany, and Belgium are thus every year debtors to foreign countries to the extent of millions of pounds. The excess of imports in the United Kingdom alone is about £19,000,000. Note that this deficit has been increasing since 1860, and sometimes in enormous proportions. In Belgium it has sextupled, in Germany it has quadrupled.

As to the exporting countries, they are not numerous, and the supply of the majority of them is decreasing. Norway is in this position, and will soon have to be content with supplying its own needs.

In Austria and Hungary the birth-rate is increasing, and with it, national industry and demand.

Finland and the United States of America seem to have reached, if not passed, their natural limit.

Russia, with its increasing population and the development of its industries, consumes more every day. Besides, for the benefit of her climate and agriculture, she must preserve great stretches of forests.

Sweden and Canada alone constitute a safe reserve. But the disastrous forest-fires which occur in Canada and the development of the pulp industry arouse a certain degree of uneasiness with regard to the forests of these countries. As to China, Egypt, South Africa, the Argentine Republic, and Australia, they are all timber-importing countries.

In short, the demand for timber keeps on increasing. Its price rises in proportion. The supply seems to have reached nearly its maximum under the actual conditions. Overproduction is not possible without dooming the forests to destruction.

We are advancing towards a timber famine. "In western and southern Europe there is not a single country where one could not find thousands and even millions of hectares of uncultivated lands, the agricultural utilisation of which has ceased to be profitable. All these lands ought to be reforested. The states ought to lavish encouragement not only by exemption from taxes but also by free gifts of seeds and seedlings, and by putting their staff of experienced foresters at the disposition of the owners for their guidance. They should not hesitate to acquire part of these areas themselves. And for the taking of these measures there is not a moment to be lost. Forest production cannot be improvised. It requires a century and a half to grow timber fit to be sawn. And the timber famine will perhaps become acute before fifty years" (13).

Now, could we not apply these authoritative words to Scotland? Is there not here a sure source of regeneration for all the country that lies to the north of the Highland border? We shall try to prove that this is the case. With this end in view, let us examine first the physical conditions of Scotland in comparison with those of similar regions, such as Scandinavia, Finland included. From the fact that both are placed on the north-western coast of Europe, in the same position with regard to the atmospheric and marine currents, there results a great similarity of climate in Scotland and in Scandinavia. Let us say at once, that if the climatic features are homologous, the temperature is milder in the former. Its lower latitude is the chief cause of this. We must add, further, that Scotland feels more directly the influence of the warm current of the Gulf Stream and of the westerly winds.

Thanks to the bend towards the south which characterises the course of the isothermal lines in these parts, the north-eastern point of Scotland enjoys a temperature several degrees higher than that of the south-western extremity of Scandinavia, the most temperate portion of the latter country. We can therefore say that heat conditions are more favourable in Scotland than in Scandinavia. As for the rainfall, it is practically equal in the two countries, and its variations are parallel, Scotland being divided into a moister western portion and a drier eastern portion, and Scandinavia being divisible in a similar manner.

If we compare the direction and the force of the winds, the parallel is not unfavourable to the Highlands. In a word, the analysis of the principal climatic factors reveals a striking analogy in their course and relative influence. There is, therefore, from this standpoint, no reason why Scotland should not be as well wooded as Scandinavia.

Let us next consider the geological data. We can group Norway, Sweden with the exception of Skäne, and Finland as a single mass superficially separated at present by the Bothnic depression, but as having formed a continental area since Silurian times. A large portion of this Scandinavian group belongs to the crystalline rocks known in their entirety under the name of Archæan rocks. In the second rank comes the Precambrian system, occupying nearly a tenth of the surface. We have therefore almost everywhere a substratum of granite, gneiss, and mica-schist.

While, in Norway, the drifts cover scarcely a tenth, at the most, of the surface of the country, in Sweden nearly the whole of the forest soil is made up of glacial till. The morainic gravels and clays form good arable land.

We need change these general features very little in order to identify them with those of the Scottish Highlands. And it is impossible to say that the geological conditions are more unfavourable to forest vegetation in the Highlands than in the Scandinavian countries.

Now Scandinavia has always been covered with vast and vigorous forests. In the southern part of the peninsula the beech finds favourable conditions up to the altitude of 300 m. The oak forms forests, the upper limit of which is still at 500 m. in 60° N.L. As we ascend, we cross the coniferous zone, which, on the average, does not extend beyond 600 m., with *Pinus sylvestris* and *Picea excelsa*. Still higher we find a zone in which the birch predominates, extending from 900 to 1100 m., traces of which are still found on the high plateau of Finmark.

Within the Polar circle 6 per cent. of the surface is wooded. There also the birch dominates, the pine is secondary, *Picea* does not exist.

Why should it not be the same, and with still more reason, in the Scottish Highlands? They were formerly covered with forests: the most positive natural and historical evidence places this point beyond dispute.

According to Dion Cassius and Herodian, the Roman legions and the auxiliary troops were employed by the emperor Severus in the year 207 of our era in cutting down the forests: 50,000 men, they say, perished in this enterprise. The ancient forest, Sylva Caledonia, which had originally an area of 20 miles, is now represented by a few small forests such as that of Coille-More or Great Wood, and that of Marr in Aberdeenshire. According to old maps, forests surrounded Stirling, Elgin, Banff, Aberdeen, Kintore, and Paisley. The great wood of Drumselch partly covered the neighbourhood of Edinburgh. Selkirkshire, formerly called Selkirk Forest, must have been very well wooded. Vast stretches of heather, peat-bogs, and marshes have replaced these old forests. Amongst the causes of destruction, particular to Scotland, we must mention the attempt of the government to take away from the Highlanders the refuge which they found in the depths of the forests. John of Lancaster employed 2400 workmen to cut down the forests of Scotland. Robert Bruce destroyed a great number of them in his expedition to Inveraray against Comyn. In the northern part of the

kingdom the Danes burned extensive wooded areas. We find an order of General Monck, dated 1654, which commands the destruction of the forest of Aberfoyle.

Tradition and the ruins which each step in the glens compels us to observe, witness that the soil formerly supported and fed a much denser population.

Beside the documents afforded by the local archives and folklore, we find in the soil itself certain proofs of this former state of things. For, in many places, and in different parts of the country, we come across entire forests still apparent by the stumps buried in the bogs or in the water.

This is convincing evidence that the limits of tree-vegetation, put at 600 m. by Robert Smith, ought in fact to be placed much higher. Furthermore, Smith himself recognises that the character of the vegetation does not become plainly Alpine until we reach the height of 900 m. Here again we are dealing with one of those phenomena of lowering of the treeless limit which Prof. Flahault describes in the Alps and elsewhere (7).

From this rapid exposition of the facts we may draw the following conclusions :—

I. That there were formerly forest areas in Scotland which have been destroyed by man within historic times.

II. That there is in Scotland a combination of all the physical conditions favourable to forest vegetation.

III. That the actual circumstances render essential the reconstitution of a wooded area as large as possible.

In the Scandinavian peninsula, the lumber trade employs about 83,000 workmen yearly. If we consider the families of these workmen, the numerous kindred industries, and all the industrial and commercial population which the support of these people requires, we can appreciate the important *rôle* which this addition might play in the regeneration of the Highlands.

It is well to mention that the work of reforestation would tend to do away with a large part of the mountain peat-bogs which have owed their extension to deforestation alone. Drainage, moreover, would contribute to the salubrity and habitability of the country (1, 8, 20). We have only to glance at the admirable work of the French foresters, in particular at the preliminary works and the reforestation of Mont Ventoux, Mont Aigoual, etc., to gain confidence with regard to this.

But as soon as we decide on reforestation, we have to face numerous practical problems, the solution of which requires all the skill of the forester and all the science of the botanical geographer.

This in itself is sufficient to show how great would be the practical advantage of a botanical, agricultural, and forest survey of Scotland.

In this country we find united all the circumstances likely to favour this project. I refer to the existence of very valuable documents upon which botanical geography might draw in full confidence. Detailed climatic data have been collected by Dr. L. Buchan in such a manner as to permit of the meteorological analysis of no matter what part of the

country. The conditions of the soil, its relief, its nature, its composition, in a word the whole of its physical geography, have also been well studied.

It is to Sir Archibald Geikie that we owe the compilation, the criticism, and the interpretation of the observations made up to his time, to which he has himself so largely contributed (9). He has produced a conclusive synthetic work on the question. We cannot do better than take it for a basis. As for detailed geological documents, the botanical geographer will be well served by the admirable work of the geological survey of Scotland, the staff of which is as valuable an auxiliary as one could desire.

Finally, since the fundamental work of Dr. Buchanan White we may consider the flora as well known. The very precise indications of station contained in his book give it a considerable value (18).

The botanist will find data in the well-preserved traditions of the country, and in the numerous local documents which will aid him to restore the primitive vegetation with a high degree of probability.

Conclusions:—

I. The duty of supervising the rational utilisation of the soil falls to phytogeography. This new science is at the present time able to undertake the task thus imposed upon it.

II. It is urgent to establish in each country a botanical, agricultural, and forest survey.

III. Numerous economic motives render the creation of such a survey particularly necessary in Scotland. All the conditions favour its establishment in that country.

Botanical geography is the necessary tie which unites geology and physical geography to the history and economy of human associations. It was the vegetation which determined "the frame in which the first peoples grew up, in which they must necessarily have grown up. It marked out the routes which they have followed in their migrations, and showed them the points where it was expedient to throw off their swarms. It has enabled us to foresee the normal future of these colonies which the instinct of the parent-races placed where they might increase and prosper. The vegetation marks the limits of the development of human societies. To some of them it gives abundance and condemns others to the nomad life. It dominates and controls the economic and social factors. It is the foundations of history. This justifies the interest which it inspires" (4).

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THE FAUNA OF SWITZERLAND IN RELATION TO THE GLACIAL PERIOD.

FEW branches of geography are of greater interest than the distribution of plants and animals over the face of the globe. To the untrained eye one mountain may structurally seem much like another, the rivers and lakes of one country quite like those of some other country; but differences in the flowers and insects, the birds and mammals of different localities, never fail to strike even the most unobservant. In consequence, the accumulation of facts in regard to the fauna and flora of geographically circumscribed regions of the globe has been aided by the number of willing helpers who have eagerly devoted themselves to the work. No one would deny that it is a supremely important piece of work. It is as desirable that the plants and animals of a country should be accurately catalogued as that its geographical features should be accurately set forth on a map. But when once the faunal and floral lists are approximately complete, something more important still remains to be done. It is necessary to consider the origin of the plants and animals, their relation to the present configuration of the land, and to past and present geographical conditions: to explain so far as is possible how they come to occupy their present stations, and to find out their original home. Of readily accessible countries, few have perhaps excited more interest as regards their fauna and flora than Switzerland, where the sunny slopes, with their carpet of vivid flowers and their crowd of brightly tinted butterflies, are so strongly contrasted with the dead wastes of snow above. That this interest has not been merely the casual emotion of the

summer visitor, the long array of papers on the subject has abundantly proved. So numerous have these papers been, that Professor F. Zschokke of Basel, himself an enthusiastic worker at the problems of Alpine faunas, has thought the time ripe for a general discussion[1] of the relation between the past and the present in regard to the plants and animals of Switzerland. As his pamphlet is not very readily accessible in this country, it has been thought that a brief summary might prove acceptable to the readers of the *Magazine*. It should be noticed that although Scotland is not, like much of Switzerland, still under the influence of an "Ice Age," yet there are many analogies between the plants and animals of the two regions, so that Professor Zschokke's conclusions are of special interest in this country. When the projected survey of the Scottish lakes is completed, the analogies between the two countries will no doubt be seen to be even more striking than appears at present, for it is upon the study of the minute organisms of the Alpine lakes that Professor Zschokke's most important conclusions have been based, and he speaks with justifiable pride of the extensive plankton investigations which his countrymen have carried out within the last few years.

The peculiar nature of the *flora* of the High Alps is so well known that it is not necessary to do more than briefly recall its salient characteristics before comparing with it the animal world. The fact of the near affinity between the flowers of the High Alps and those of the circumpolar regions and of the North generally is almost a commonplace. According to Heer, almost half the flowers of the High Alps occur also in Scandinavia and the North, while half the plants collected by Kane between 60° and 80° North Latitude, also occurred on the hills of Switzerland. The nature of the relation between the floras of the two regions is emphasised by the occurrence on isolated mountain-tops in the district lying between the Far North and Switzerland of certain members of the Alpine flora. These much-prized Alpine plants, which are found in parts of Scotland, in the hilly districts of England, and in parts of Germany, have not at their disposal the ordinary means of dispersal by wind, water, and animals, and must undoubtedly be regarded as relics of the glacial period. The flora of Switzerland, therefore, certainly shows distinct traces of glacial influence, in the presence in the mountain regions of plants of Arctic character.

At first sight the mammals, on the other hand, seem to show no similar trace of the influence of the glacial period, for not only are lemming, reindeer, Polar fox, and glutton entirely absent in the Alps, but the presence there of chamois, ibex, and marmot emphasises the difference from Arctic regions. The explanation is, however, to be sought in the fossil contents of the bone-caves found in many parts of Switzerland. These show that at one time reindeer, musk-ox, lemming, and many others lived in the Swiss area in company with the existing mountain forms and with others. When the temperature rose at the close of the glacial period, some of these animals, as, for example, reindeer and lemming, followed the ice northwards, while others, such as chamois,

[1] *Die Tierwelt der Schweiz in ihren Beziehungen zur Eiszeit* (Basel, 1901), pp. 71.

ibex, and marmot, climbed the slopes of the Alpine hills, and the plains thus left vacant were invaded by new mammals, probably of Asiatic origin, which form the existing mammalian fauna of the low grounds. That is, when the fossil history of the Swiss mammals is considered, the effect of the Glacial Period is as obvious as in the case of the plants.

Much the same tale of northern relationship is told by the other members of the land-fauna, the terrestrial molluscs, the insects, and the reptiles; the relationship being in most cases emphasised by the discovery of fossil forms, even more distinctly Polar in type than the members of the existing fauna.

On the other hand, in regard to the majority of water animals, fossil remains do not exist, so that conclusions can only be based on a thorough study of the existing forms. It is to the careful study of these animals that so much attention has been devoted in Switzerland in recent years.

Of the numerous lakes and ponds which are so liberally sprinkled over the Alps, many exhibit distinctly Polar conditions. In the lake of the St. Bernard Pass, ice is often present for more than three hundred days in the year, while in still other cases the waters are not freed every year from their ice-crust. Even the sheets of water which occur at a much lower level, if they receive glacier streams, may never rise in temperature above 5°-6° C. The fauna of these chilly basins is of a composite character. In the first place, there is a well-marked cosmopolitan element, including unspecialised forms of simple character, which occur practically in all parts of the globe, and from whose presence no general conclusion can be drawn. In addition, there are a number of forms exhibiting a northern facies, and presenting a striking analogy to the definitely Alpine plants. Thus the little bivalve *Pisidium loveni*, occurs in the High Alps and in the extreme north of Scandinavia: the small water-beetles belonging to such genera as *Hydroporus*, *Agabus*, *Dytiscus*, and *Helophorus*, which swarm in the high Alpine waters, are rare in the plains, but occur sporadically in *e.g.* the waters of the Riesengebirge, before they reappear in multitudes in circumpolar regions; again, the little Copepods, *Diaptomus bacillifer* and *D. denticornis*, which are the characteristic members of the high Alpine fauna, are sprinkled over the intervening parts of Europe in upland waters, before they reappear as the characteristic forms in the lakes of the extreme north.

In addition to these two elements in the Alpine water fauna—the cosmopolitan and the Arctic or Boreal—there is still a third, admirably represented by the flat-worm, *Planaria alpina*. This occurs in virtually all Alpine streams, in certain streams in the low ground of Switzerland, and in cold streams in parts of Germany, Scotland, and elsewhere, but is not known from the extreme north, so that it might be looked upon simply as a mountain form, were it not that there is other evidence which proves that it is a relic of the Glacial Period. In considering the origin of such aquatic forms, it should be noticed that while it may be said that in regard to its plants, each Swiss mountain is surrounded by a double zone, the upper or Alpine, and the lower or Plain flora, there is necessarily no such sharp line of demarcation in regard to the fauna of running water. The mountain forms are continually striving to encroach upon

the plain area, while the inhabitants of the latter, if dominant, are constantly tending to drive the former further up the hill-sides. Where, then, in the case of forms of which *Planaria alpina* may be taken as a type, no definite conclusion as to origin can be drawn from the present geographical distribution, on account of the facilities for both active and passive dispersal, and where palæontological evidence does not exist, is there any means of ascertaining the original home? Professor Zschokke points out that modern Biology can offer at least hints towards the solution of this apparently insoluble problem.

It is obvious that no organism can persist at high altitudes, unless its reproductive phenomena are adjusted to the special physical conditions. Comparing the inhabitants of low and high level waters, it is obvious that the former usually begin to multiply in spring, while the upland waters are still ice-bound. Not until the spring of the plains has long yielded to summer does the ice-crust on the mountain tarns melt into water, and the inhabitants of these waters then begin at once their active life of multiplication, although the temperature of the water may be extremely low. If forms which have lived in such upland waters be introduced into the lakes or streams of the plains, they will continue to reproduce (sexually) at the time of year when the temperature of the water is the same as it is during the short summer in the high level waters. Therefore, as the temperature of summer at high altitudes is the temperature of winter at low, high level organisms which have invaded the plains will reproduce in winter. Conversely, all those organisms now found in the plains whose normal reproductive period is late autumn or winter, are to be regarded as relics of the Glacial Period, have persisted since the time when the present winter or autumn temperature was the highest attained throughout the year. We must therefore look back to the melting glacier water of the close of the Ice Age for the ancestors of many common forms which reproduce in winter. The methods of reproduction of many of these point to the same conclusion; for it is characteristic of cold water forms that the number of eggs or young is reduced, that the amount of food-yolk is increased, that the life history is abbreviated, so that it may be rapidly run through during the short period when conditions are favourable, and that protective investments for young or adults are common, so that the germ of life may lie latent during the long period of Arctic winter. Such peculiarities are visible not only in forms from the High Alps but also in those now inhabiting the Arctic region.

A resemblance between the fauna of high latitudes and of Alpine regions is shown not only in the similarity of the reproductive phenomena, but also in certain other peculiarities. Thus in both cases the Copepods are remarkable for their permanent bright red tint, while in the lakes of the plains this colour is only discernible during winter. It may thus be said that there is a physiological resemblance between Arctic and Alpine forms.

Basing his opinion largely upon the fact that the members of the family Salmonidæ (salmon, trout, etc.) spawn in winter, Professor Zschokke argues further that the members of this family are of northern

origin, and that the presence of non-migratory forms in the lakes of Switzerland and of other parts of Europe is a direct consequence of the Glacial Period. These forms, or their ancestors, travelled southward during the period of melting ice, and, owing to the abundance of waterways at that period, reached the great inland lakes which then covered many parts of Switzerland. As the amount of water diminished, the channels which served for this migration became impassable, and the fish, becoming stationary, developed in the course of successive generations into the familiar forms of to-day.

Further, Professor Zschokke believes that there is much evidence to show that a similar explanation holds good with regard to many of the minute organisms which swarm in the Alpine lakes. For example, two minute Crustacea, *Daphnia hyalina* and *Bosmina coregoni*, occur not only both in the high and low level lakes of Switzerland, but also throughout those regions of Europe in which morainic deposits occur, *e.g.* in Britain, in Scandinavia, North Germany, and so on. In these cases transmission of the two forms from lake to lake, is from their structure and mode of life impossible, and it is noticeable that both are absent from recently formed sheets of water. The analogy to the lacustrine species of trout and charr thus indicated, is greatly accentuated by the fact that the Swiss lakes have each their characteristic varieties of *Daphnia hyalina* and *Bosmina coregoni*, just as they have of trout and charr. In both cases the forms have been isolated for a period sufficiently long to allow species formation to begin.

Professor Zschokke sums up the whole matter in the following description of the changes produced in the fauna of Switzerland and the neighbouring countries by the Glacial Period. As the glaciers invaded the lowlands, they drove before them from the mountains the old fauna of the streams and lakes, which in the plains mingled with migrants similarly driven from the northern regions by the advance of the ice there. The result was to produce a fauna of mingled Boreal and Alpine character, in which Alpine Hydrachnids and glacial aquatic beetles doubtless existed side by side with northern Crustacea. The variations of the northern (Arctic) and southern (Alpine) ice-masses probably affected the respective faunas also, favouring now one and now the other element in the struggle for existence. When the ice-sheets finally retreated to the North, and to the heights of the Alps respectively, different fates overtook the various elements of this mixed aquatic fauna. New water-channels allowed a portion to reach the Polar regions; another moiety found a refuge by sinking to the depths of the lakes as the surface waters became warmed, whilst still another ascended by the mountain torrents once more to their old elevation. A remnant kept its hold in the plains even under the new conditions, but in most cases only at the expense of deep-seated modifications of habit and appearance.

At the same time the great body of fresh water poured into the sea by melting ice resulted in a diminution of salinity which made it possible for many marine organisms to become gradually accustomed to brackish water, and thus enabled them to finally ascend the rivers and

reach the inland lakes. To this cause is to be assigned the gradual colonisation of many lakes by members of the salmon family, which, as already indicated, were afterwards cut off entirely from the sea, and also by many minute Crustacea and free-swimming Rotifers. That the seas of the north constituted the centre of dispersion for the plankton of Switzerland seems probable on several grounds. Even at the present day there exist in northern regions all stages in the transition between salt and fresh water, owing to the influence of melting ice, while at the junction line between salt and fresh water, Nordenskiöld and Levander have shown that there exists a fauna extremely resistant to variations in salinity. There seems little doubt that the little fresh-water Crustacea of the family Cytheridæ, for example, were derived from northern marine forms. Again, the planarian worm, *Automolus morgiensis*, lives now in the Baltic, in the great depths of the lowland lakes of Switzerland, at the edge of the high Alpine streams, and is also not entirely absent from the shallow waters of the plains. This certainly suggests migration from the north. While in many of these cases the marine origin is merely a deduction, it is one which is strongly confirmed by the fauna of the lakes of Pomerania, *e.g.* the Madü, and the basins of north-west Russia, which contain forms of definitely marine origin, apparently introduced during the fourth great glacial period.

At the same time that the streams just freed from ice were being colonised by this northern marine plankton, they were also invaded by a cosmopolitan element, which spread rapidly over the plains and ascended towards the mountains. The post-glacial fauna of the higher Alpine regions had thus three elements (1) that of northern glacial type which persisted throughout the Ice Age, (2) the new immigrants from the northern seas, and (3) the cosmopolitan elements which appeared as soon as the conditions became at all favourable in the plains, and gradually ascended towards the hills. Similar conditions prevailed in the plains, but here the cosmopolitan and post-glacial immigrant elements largely predominated over the primitive glacial forms, which became limited to specially cold sheets of water, and to the depths of the great lakes. Much the same might be said of the land fauna and flora, but owing to the more uniform temperature of the water, the intermixture of the elements in this case is more thorough, while the terrestrial forms tend to occupy successive zones of the surface.

It may be useful to briefly sum up these general conclusions as to the origin and relations of the present fauna and flora of Switzerland :—

1. Flora.

The flora of Switzerland consists of two elements, almost as sharply separated from one another as regards distribution over the surface as they are in structure and appearance. These are (*a*) the Alpine, and (*b*) the Plain elements. According to Professor Zschokke the first had its original home in northern Asia, but with the advent of Arctic conditions during the Glacial Period spread itself over much of Europe.

As the climate became milder at the close of the period life in the hot plains became impossible for these plants, and, in the picturesque language of Professor Zschokke, the bridge between the floras of the Far North and of the mountains of Switzerland broke through, leaving only fragments on the hills of Germany and Great Britain. Where, as in the North and in the Alps, Arctic conditions persisted, the members of this flora also persist in undiminished abundance. The gaps made by the disappearance of the Alpine flora in the lowlands were filled up by new immigrants (*b*), which speedily ascended the hills, and now form a zone immediately below that occupied by the Alpines.

2. Fauna.

(*a*) *Mammals.*—As indicated above, no obvious relation now exists between the mammals of the High Alps and those of the Arctic regions, but fossils show that both once lived together in the plains of Switzerland. When these glacial mammals quitted the plains in post-glacial times, one moiety travelled northwards and the other ascended the Alps. The plains were then invaded by new mammals probably originating in south-east Siberia.

(*b*) *Other land forms.*—The Alpine land snails, the Alpine insects, and such high Alpine forms as the lizard, *Lacerta vivipara*, show a similarly marked relation to northern forms, and are again to be looked upon as remnants of a once continuous glacial fauna.

(*c*) *Aquatic forms.*—With regard to these, the problems of origin and relationships are more complicated, owing to the fact that Alpine and Plain elements cannot be so sharply separated as in the case of land animals and plants. The conditions of existence in the depths of the great lakes are indeed practically those of the High Alps. Nevertheless, as already explained, it is possible first to distinguish a cosmopolitan element, which has no analogues among the plants, which extends to the upward limit of animal life, and of whose origin it is not possible to say anything. Again, a second element is entirely comparable to the Alpine plants, for it includes forms abundant in the High Alps and in the Far North, and found in isolated spots in the region lying between these two extremes. Finally, the cold waters of Switzerland include a third set of animals, which are not known from the North, and which might simply be regarded as mountain animals. There is much evidence to show that these, together with certain forms which have established themselves in the plains, have been derived from northern marine forms, which first became adapted to life in fresh water at the time when the melting of glacier ice had greatly diminished the salinity of the northern oceans.

Professor Zschokke concludes by saying that it is thus seen that "the history of the theatre decides the fate of the actors; the changes on the surface of the earth are mirrored in the distribution and mode of life of its inhabitants." While much that is contained in his paper is perhaps at least in outline generally familiar, two points should be noticed as of special importance. First, that he discusses the life of

Switzerland as a whole, whereas in the majority of cases previous authors have been content to take plants only, or some special group of animals; and second, that he shows that modern Biology, in investigating the physiology of organisms, has furnished a new weapon which may be used in attacking problems of geographical distribution.

THE PHILADELPHIA COMMERCIAL MUSEUM.

By Victor V. Branford, M.A.

In the study of social evolution, the United States of America, it has often been noted, offers special advantages as a field of observation, by reason of the rapidity with which change there proceeds, and the facility with which ideas crystallise into institutions. A conspicuous example of this characteristic principle of American life is afforded by the Philadelphia Commercial Museum. Younger in years than the more important of similar institutions in Europe, it is the senior of all of them in maturity of development. In its earlier period the Museum, it has been said with an unusual combination of accuracy and wit, consisted of Dr. W. P. Wilson and his amanuensis. It was Dr. Wilson, then a scientific botanist, now the Director of the Museum, who conceived the project—instinctive to the mind of a naturalist—of retaining some of the exhibits of the Chicago Exhibition of 1893 to form the nucleus of a permanent collection representative of the world's industrial products. To carry out that purpose the Municipality of Philadelphia was persuaded to vote a sum of £2000. Thus it came about that in 1894 the Museum was modestly established as a quasi-municipal institution in the city of Philadelphia. So remarkable has been its growth that to-day its vast collections of classified material monopolise sixteen acres of ground, it commands an annual revenue of more than £40,000, and it utilises, by an ingenious system of co-operation, the services of an army of foreign agents, representatives and correspondents numbering not far short of 100,000, who extend its ramifications to the ends of the earth. In partial explanation of this phenomenal expansion might be cited Sir W. H. Fowler's dictum that "what a museum really depends on for its success and usefulness, is not its buildings, not its cases, not even its specimens, but its curator." But it is manifest that so rapid a growth could only have taken place in a highly favourable medium. An examination, however, of the external factors which have conditioned its growth would entail an incursion into the industrial history of the United States, and that, though a useful, is not an indispensable preliminary to an understanding of the aims, the internal structure, and the features of the Museum itself.

It is not easy to comprehend the *ensemble* of the Museum, for notwithstanding the existence of many commercial museums, there is no other institution of a wholly analogous kind in any other country. In England, for instance, we might put together the Imperial Institute (organised on a world scale), the Royal Geographical Society, the Com

mercial Intelligence Departments of the Board of Trade and of the Foreign Office, and throw in the commercial page of the daily press, and then concentrate and weld these into a single organisation, but we should still be short of exhausting the manifold functions of the Philadelphia Commercial Museum, though, to be sure, our imaginary composite institution would perform certain functions outside the museum's sphere of activity. Truly the claim of its founder that it is "in aims and results unique" cannot be disputed.

In an official publication "the objects of the institution" are set forth as follows:—

1. To gather from all parts of the world and to make immediately available to business men, full and special information concerning trade conditions and trade connections.

2. To place on exhibition manufactured products from other countries, in order that manufacturers may be properly informed concerning the requirements of markets which it may be possible for them to enter.

3. To bring before the manufacturers, dealers, and consumers of the United States samples of all the various products of the world, that they may know and choose such as are useful to them.

4. To make complete examinations, analyses, and tests of these products, and to publish such information concerning them as may lead to a general understanding of their usefulness.

To resume in a phrase aims and objects so comprehensive and varied as those indicated in the above four propositions is doubtless impossible. At the same time the scope and character of the Museum may perhaps be indicated, with a considerable degree of accuracy, as the compilation of a catalogue *raisonné* of the world, from the point of view of the American exporter.

The main sphere of operations is covered by the work of three specialised departments—I. the Museum proper; II. the Laboratory; and III. the Bureau of Information. Each of these departments is, however, so correlated with the others that the contribution of each dovetails into that of the others, in such a way that the resources of the whole institution are brought to bear at all points of its organisation. The ordinary sort of commercial museum with which most people are familiar, aims primarily and often exclusively at a collection of specimens of produce characteristic of the national resources and the industries of different countries. This also is a primary object of the Philadelphia Museum, but it is supplemented by numerous complementary efforts, which, taken singly, might not differentiate this from all other similar institutions, but which in combination justify its claim to a unique position.

In the Philadelphia Museum the raw produce is displayed in duplicate, or even in some instances triplicate collections, based on different systems of classification. In what is called the Geographical Collections, the produce is grouped according to the countries of its origin. Here the data supplied by the Museum, in addition to the mere specimens and illustrations of produce, enable the scientific investigator to correlate the produce with the other natural features of the country, such as climate

and soil, and thus arrive at an estimate of the natural resources of each nation or geographical region. But the practical needs of the merchant, *qua* merchant, are not less, but rather more prominently kept in view. For this purpose the quantities of produce on show are regulated by mercantile ideas—for the scientific specimen is not necessarily identical in bulk with the commercial sample. Also data are supplied as to spot price, cost and means of transport, quantity available, names and addresses of reliable agents, dealers, shippers, etc.; in short, all relevant public and semi-public commercial information. For instance, the manufacturer whose staple is wood, finds displayed thousands of samples brought from all quarters of the globe, and embracing nearly every known variety of wood in sufficient size and quantity, accompanied by data necessary for him to determine their value in his particular industry. In the same way, for the textile manufacturer, there are samples and data covering the ground exhaustively in regard to the wools, silks, cottons, vegetable fibres, etc., from every foreign country. Similar Monographic collections—as these world collections are called in the nomenclature of the Museum, in contradistinction to the Geographical ones, as the regional or national collections are called—of hides, skins, leather, tanning materials, dye stuffs, food products, oils, medicinal drugs and herbs, minerals, etc., enable dealers in these products to keep fully posted regarding the constantly changing conditions of the markets of the world —these collections being renewed and augmented as the progress of industry may require. But though these monographic collections of raw produce are primarily intended to serve commercial ends, yet they have also their uses in pure science. They have an immediate relevance in the scientific study of world resources, just as the geographical collections have in the study of national resources. It is clear they have also a fundamental place in those systematised studies of observation and classification of the elementary facts of the physical environment, which are a necessary preliminary to the foundation of every concrete science, but which professed economists have perhaps inadequately prosecuted, notwithstanding the reiterated claims of economics to a place in the circle of the positive sciences. These remarks, as to the scientific character of the Museum, apply with equal cogency to its work in dealing with manufactured products. In the collection of specimens of manufactured products and in the accumulation of the supplementary relevant data, the unit of investigation is the Market. In other words, the basis of research is here not so much the geographic as the economic region. In this branch of its work the Museum keeps under constant review the markets, more especially of South America, Australasia, India, Africa, and the far Orient. The point of view is that of the American exporter, and the aim is the immediately practical one of finding fresh customers for the goods of the American manufacturer. But the search for information is pursued by the Museum according to rigidly scientific methods of observation and classification. And the accumulated data are freely and entirely at the disposal of the economist no less than the man of business.

The investigations by the Museum into market phenomena are made

under the following heads:—(1) character and variety of each given article on the given market at the moment of investigation; (2) manufacturers supplying the market, their names and addresses, with historical reference to their connection with this particular market; (3) quantity of goods annually imported with reference to countries of origin, declared values, etc.; (4) manufacturer's price at factory, and terms of payment usually demanded of and granted by him; (5) price at which the article is being sold by the importer to the retailer, and by him to the consumer; (6) information regarding facilities of transport and relative shipping rates and charges between American seaports and the given market, as compared with the rates prevailing between it and other countries; (7) customs charges and regulations as to invoice marking, declaration, etc.; (8) recommendations as to marking, wrapping, labelling, and packing, as governed by climatic conditions, transportation facilities, handling, etc.; (9) leading importers trading in the article in question with names, addresses, financial standing, etc.; (10) the field of distribution controlled by the market under review.

Such is the general character of the information with which the Museum supplements its collections of specimens of manufactured products. Thus, for instance, the manufacturer of cotton goods, who is desirous of wider markets for his products, finds thousands of samples showing him in the greatest detail the styles of goods which at the moment are being sold in each foreign market, and at the same time he has the means of informing himself concerning the weights, widths, lengths, and patterns which are in favour, the current prices, wholesale and retail, and the numerous other items of definitive knowledge necessary to a scientific analysis of certain practical questions which manufacturers and exporters put to themselves. Every one who offers goods in a market is, whether he knows it or not, conducting an experiment in economic science, for he is seeking to verify a conclusion already reached as to existing relations of demand and supply. In forming these conclusions the merchant conforms more or less closely to the rigorous canons of scientific method. It is the office of the Museum to help him to do it more so, rather than less. In its detailed investigations of particular markets the Museum, it is clear, is studying specific, concrete instances, at a given place and time, of those phenomena of demand and supply which in their abstract and generalised relationships engage the attention of economists. From this point of view the Museum is to be classed among those organisations for co-operative research, to the growth of which contemporary science owes its chief advances. In short, it is an Institute of Economic Science, and thus forms a connecting link between the academic economist and the merchant, in somewhat the same way that the physiological laboratory stands between the scientific biologist and the medical practitioner. The analogy, to be sure, is far from perfect, but this is not the place to examine how and why.

As the work of collecting, arranging, and renewing specimens of raw and manufactured products belongs to the specialised department already referred to as the Museum proper, so the work of gathering, tabulating,

and systematising the supplementary data is undertaken by groups of specially trained officials, who with their appurtenances and appliances constitute the department called the Bureau of Information. Amongst the sources from which this information is drawn are the following (as summarised from a descriptive account by Dr. Wilson, the Director, in the *Forum* of September 1900):—

First, the trade journals of different countries, of which some fifteen hundred are regularly received at the Museum. As fast as they arrive, they are turned over to a staff of readers versed in different languages, who cull from them what facts appear to be worth preserving. The information thus received is indexed by the card system. Matters calling for immediate attention are at once brought to the notice of those manufacturers for whom they may be of practical value. For example, if it should be learned that there is a special demand for harvesting machinery in Argentina or Australia, that fact is made known at once to manufacturers of agricultural machinery; the report being accompanied by special directions concerning special kinds of machinery desirable, and the way of reaching the market is indicated. Some 2000 such notices are sent out in the course of a month.

Second, the consular and other official reports of the United States and of foreign governments—these being analysed and compounded in the same way as are the trade journals. Of these the Museum has a large collection. It has, in fact, a greater number of official reports and books detailing commercial information than has the government at Washington.

Third, the reports of special representatives. The Museum maintains a corps of special students of trade conditions, some of whom are constantly at work in foreign countries, studying the markets in the interests of American exporters, and endeavouring to bring foreign governments and dealers in touch with the Commercial Museum.

Finally, the communications of the Museum's foreign correspondents —the representatives of reputable importing and commission houses abroad. The interest of these correspondents is usually maintained through a system of co-operation. It frequently happens that letters are received from strangers abroad asking for certain specific information. In such cases the Museum, provided it is assured of the reliability of the writer, suggests an exchange of courtesies whenever any particular information is desired. By this arrangement the Museum has succeeded in building up a staff of nearly 20,000 regular and some 60,000 occasional correspondents. About 125 clerks are employed at the Museum in carrying on this correspondence and in tabulating the information received. The distribution of information through circulars and the correspondence with subscribers are conducted by another department.

Important among the items of information sought by this bureau is that of the financial standing of commercial houses in foreign cities. The names of reliable foreign importing and commission houses are entered on a list, which is frequently revised and kept up to date. When a question concerning the standing of any concern arises, and the report

proves to be well founded, the name of that firm is struck off from the list. That the Museum's work in the matter of credit-rating has been of considerable value is proved by the many testimonials to that effect received by the institution from American exporters.

To say that the Bureau of Information is a Clearing House of current commercial news is to emphasise its practical and immediately utilitarian aspect. But when one recognises, what is indeed obvious, that the Bureau is the means of co-ordinating a vast amount of crude economic experience that otherwise would remain as isolated facts or as detached items of thought, it is clear that the work of the Bureau has important scientific bearings. And this not only by its direct contributions to the growth of economic science through the systematisation of knowledge, but also by its educational reaction on the manufacturers, merchants, and other members of the mercantile community with whom its manifold activities bring it into contact. It is, for instance, currently said that United States Consuls are in process of habituating themselves to report to Philadelphia rather than to Washington. If that is so—as indeed is most likely—the Museum is already functioning, in fact, if not in name, as a school of consular service, and will more and more determine the methods and ideals of consular—not to say diplomatic—duties.

Its direct and explicit efforts in the field of pedagogic education would seem to be mainly directed, at present, to the improvement of the teaching of Commercial Geography in schools and colleges. For this purpose, type collections of produce, accompanied by the relevant descriptive matter, both printed and pictorial (exhibiting commercial processes as well as products) are prepared and distributed amongst educational institutions. Arrangements are also made whereby teachers and students may visit the Museum at regular intervals for systematic study under the skilled guidance of the Museum officials. The further development of these tentatives in the direction of Higher Commercial Education has been declared by the director to be one of the aims of the near future.

Of the third specialised department of the Museum little need be said, as its official designation—Laboratories of Technology and Tests—sufficiently indicates the scope of its work. Here the resources of chemistry, microscopy, and other appliances of physical investigation are placed at the service of American manufacturers and merchants who may desire to know, for instance, the percentage of cotton in a given article of "pure linen" goods, of maize in "wheaten flour," of water in caoutchouc, of copper in an ore, and what not. But while the laboratories are thus serving the practical ends of private business, they are also contributing to the progress of purely scientific knowledge by introducing quantitative precision into the observation of economic phenomena, which it is the business of the Museum as a scientific institution to describe and record with the maximum of accuracy.

The foregoing brief and inadequate account by no means exhausts the activities of the Museum regarded as an organ of intelligence. But sufficient has been said to show that it is an institution of a highly militant character operating simultaneously in the fields of Commerce,

Science, and Education. That it offers any approximation to a genuine synthesis of the scientific, the educational, and the practical, it does not of course claim. On the contrary, it purposely subordinates the two former to the latter. That to be sure is the defect alleged against American institutions in general, which has caused one of the most eminent of German educationists to use the word Americanism as a technical antithesis to the cultural ideals expressed by the word Hellenism. But the reproach can scarcely be urged against the Philadelphia Museum, since it set out with the specific aim of placing the resources of contemporary science at the immediate disposal of the American exporter. In doing so it has incidentally, and so to speak, as a work of supererogation, aided both Economic Science and Commercial Education. But that the work of the Museum is deliberately moving towards a combination of the commercial, the scientific, and the educational, into a more harmonious unity is sufficiently attested, not by the magnitude but by the direction of growth since its foundation in 1894.

The same tendency is visible in the more permanent publications of the Museum. Conspicuous amongst these is a series of Monographs, now appearing, on the resources of the younger and less-known countries, intended to be useful to men of business, but which at the same time are admirable examples of Regional Survey, and might serve as manuals of scientific geography. But even the ephemeral publications, issued as current news, sometimes in combining exhaustive analysis of detail with synthesis of diverse factors, reach a comparatively high level of scientific documentation. As an example of this variety of publication may be cited a recent report on ploughs in use in Australasia, because it at once exhibits the efficiency of the Museum as a centre and focus of international information of unparalleled completeness, and at the same time reflects that militant attitude which so profoundly differentiates the Museum from the habitual passivity which is normal to European institutions which have any pretensions to the performance of learned or scientific functions. The occasion of the report was this—a high official in Australia made the remark publicly that a Canadian agricultural implement-maker practically monopolised the trade of Australasia. As the guardian at once of commercial exactitude and the domestic manufacturer, the Museum promptly came forward with contradictory evidence. Within forty-eight hours of the pronouncement by the Australian official, the Bureau of Information compiled a comprehensive review of the agricultural situation, embracing the whole of the continent of Australasia. The review quoted prices asked for a dozen different makes and styles of plough actually on sale at the moment in a country 15,000 miles distant, accompanying such prices with photographs of the ploughs in question and a technical description of their construction so minute that, it is said, the articles could have been reproduced from the specifications and photographs. But what gave to the review its value as a scientific document was an appendage containing a lengthy analysis of the various soils and a synopsis of climatic conditions, crops, seasons, and local farming tastes and traditions in each of the seven distinct political divisions of Australasia, the whole being treated as the necessary

geographical correlate of agricultural implement making—surely a scientific achievement that would have assumed a creditable position in the transactions of the most ancient of learned societies, unless indeed indignity belongs to promptitude of compilation.

Amongst the current ephemeral publications of the Museum this report was doubtless, in comprehensiveness of scope and thoroughness of treatment, an exceptional product of the Compiling Department of the Bureau of Information. But the normal activity of this department bespeaks an organisation of resources both encyclopædic and journalistic in character. An analysis of the work of the Compiling Department of the Bureau of Information shows that during the nineteen days between October 23rd and November 11th, 1899, ninety-four subjects were covered by what are called General Reports, *i.e.* those dealing with the introduction of United States goods into foreign countries. In addition to these spontaneous activities of the Department, it also deals with what are called Special Inquiries, those being made in response to specific requests for information addressed to the Museum from the outside. During the above-mentioned period, the number of Special Inquiries received was 295, of which 180 were from domestic and 115 from foreign inquirers, amongst the latter no fewer than forty different countries being represented. The following samples of inquiries addressed to the Museum are selected almost at random from those addressed to it during the nineteen days mentioned—names and addresses of producers of pyrites in the United States; import duty on shaving and tar soap in Argentina; how to collect an unpaid account in Paraguay; commercial condition of Dominion of Canada; on establishing an oilcloth and paint factory in India; price of shoe-pegs in Hamburg per hundred kilos; laws regulating the practice of dentistry in Chile; manufacturers of sheet copper in Germany, England, Scotland, and Belgium; percentage of oil in American linseed; firms likely to be interested in Mexican real estate; shippers of sheep-tail fat; dealers in waste indiarubber; buyers of Cape aloes in Africa; market for quebracho wood; industries in the city of Ostrogoshk, Russia; agents to sell German counterpane; on the seal and salmon fisheries of Siberia; smelting works in the United States using Spanish ores; exporters of sausage casing; on cocoa—its production and consumption; United States railway rates and freight rates per mile; on Westinghouse gas-engines; on trade in corsets in Cuba; styles of closets, bath-tubs, etc., used on east coast of South America and in New South Wales, with procedure necessary for goods approved by local authority; duty on catalogues into Russia; flour dealers in Australasia and South America; annual production in the United States of wheat, flour, corn, barley, oats, cattle, sheep, wool, and cotton; firms in Marseilles and Algiers dealing in Crin d'Afrique, etc.

It remains to add a word as to the administration and finance of the Museum. The institution is in receipt of an annual municipal appropriation from the city of Philadelphia of $115,000, and has other sources of income aggregating about $85,000, the bulk of this latter being derived from the mercantile subscribers who desire to receive a regular supply of commercial information.

The accumulations and appliances of the Museum are freely at the disposal of the public, and moreover it distributes gratuitously both the General Reports and also the more important items of commercial news sifted from the records of current commercial events that continuously stream into its clearing house or Bureau from all quarters of the globe. The Museum also answers gratuitously the vast number and variety of commercial inquiries addressed to it by *bona fide* correspondents, alike domestic and foreign. But for an annual fee of $100 the Museum offers a regular and periodic service of information which will keep manufacturers and merchants posted in the movement of current events the world over, as these are likely to affect each subscriber's particular line of business. The amount of the fee for this service is fixed at such a rate as to cover only clerical expenses of copying, etc., the cost of the collection of the information being thrown in, as it is considered to result from the performance of those general functions for which the institution receives public money. Another source of revenue is derived from what is called the foreign index file. The Museum maintains abroad located in all the chief business centres of the world a number of cabinets containing the names of American manufacturers, with their lines of manufacture. For a subscription of twenty-five dollars a year approved manufacturers may have their names inserted under five different headings in each cabinet.

The Museum is directed by a Board of Trustees composed of fourteen leading citizens of Philadelphia, chosen for life, and eight *ex officio* members, chosen from the leading State and Municipal officials. The immediate management is intrusted to a director and a staff of expert assistants. Co-operating with the Board of Trustees are two other important bodies, namely, the Home and the Foreign Advisory Board. The Home Advisory Board consists of delegates from leading commercial organisations throughout the country, whose advice is sought from time to time. The members of the Foreign Advisory Board, who are expected to keep the Museum in touch with the requirements of international trade, are chosen from leading foreign boards of trade and other commercial organisations. The members of these Advisory Boards meet in Philadelphia at intervals of two years.

In the foregoing brief summarisation of its main activities, no attempt has been made to quantitatively estimate the part that the Philadelphia Museum has played in the recent expansion of the foreign trade of the United States, which has flooded the world with the products of American industry, and which during the past few years has manifested itself in an annual excess of visible exports over imports of about £100,000,000. It is however significant of belief in its potency as an organ of commercial development, that in Germany, where every resource of scientific organisation is pressed into the service of commerce, steps are being taken to establish a similar institution. But it has been no part of the purpose of this paper to plead for the mere imitation and repetition of foreign institutions, however useful and admirable in their own national applications. It has rather been my aim, in presenting a terse, factual epitome, to emphasise those aspects of the Philadelphia

Commercial Museum, in which it may be regarded as a new embryonic organ, of much social usefulness in the present, and of still greater promise for the future, provided its immediately scientific and educational possibilities be developed concurrently with its "commercial" activities. And from this point of view, the statement may be hazarded that not only every nation, but even every large city, might find in the essentials of the Philadelphia Commercial Museum, a type of initiative for local reproduction and adaptation. The growth of the scientific and educational applications, would of course, in any well-ordered scheme, proceed in correlation with existing agencies and institutions, and in this connection it is a transcendent merit of such organisations as the Philadelphia Museum, that they tend to harmonise two groups of interests—the cultural and the mercantile—which are not unusually wont to regard themselves as naturally antagonistic and in inevitable opposition. As an instrument of concrete scientific research, a Commercial Museum of this type surely has its proper place in the local University as the appropriate Institute of practical work, which is a necessary complement to the theoretical studies of an Economic Department or Faculty.[1] But no less is it the necessary and legitimate instrument of the local Chamber of Commerce in the collection and dissemination of trade information. And thus may arise one of the too few common meeting-grounds of pure and applied science, of education and business, of culture and commerce.

THE DISCOVERY OF THE SOLOMON ISLANDS.[2]

The manuscripts translated in these volumes give an account of an expedition despatched in 1567 by the Spanish Governor of Peru for the discovery and colonisation of lands which were believed to exist some 600 leagues (upwards of 2000 miles) across the great ocean to the west of the South American continent. In that age the air was full of tales of undiscovered continents and islands abounding in gold and wonders. The spirit of discovery and adventure possessed men's minds in a measure never before exceeded. Already in 1565 a Spanish expedition had crossed the Pacific from New Spain north of the equator and had founded a colony in the Philippines. Larger and even richer territories the Government of Peru hoped to find nearer at hand in the Southern Ocean.

The expedition sailed from Callao in two small vessels of 250 and 107 tons. They carried a company of about 150 men. About half of

[1] *Vide* Report of the International Association for the Advancement of Science, Arts, and Education, on Museums and Institutes, 1901, page 6.

[2] *The Discovery of the Solomon Islands by Alvaro de Mendaña in* 1568. Translated from the original Spanish manuscripts. Edited, with Introduction and Notes, by Lord Amherst of Hackney and Basil Thomson. London: printed for the Hakluyt Society, 1901. Two volumes: pp. lxxxvi; 182.

these were soldiers, a few were slaves, and the rest were pilots and seamen. The chief command was given by the Governor of Peru to his nephew, Alvaro de Mendaña, a young and untried man. But there went with him several tried and capable colleagues: Hernan Gallego, an experienced navigator, chief pilot; Pedro Sarmiento de Gamboa, already a soldier and traveller of repute, later on destined to become one of the celebrated navigators of the century; Pedro de Ortega, master of the camp; Don Hernando Henriguez, captain-general; and Gomez Catoira, chief purser. To conquest and settlement the commission of the leaders piously added as an object the conversion of infidels to the Christian faith. To this end, as well as to minister to the spiritual welfare of the members of the expedition, it was accompanied by four Franciscan friars.

After a voyage beginning on the 19th of November 1567, across more than 7000 miles of sea, high land was at length sighted on the 15th of January 1568. It was part of the island which the commander named Santa Ysabel. The pleasing aspect of the country, as well as the immediate discovery of a convenient harbour, allayed the many misgivings to which the prolonged voyage had given rise, and preparation was at once made for exploration. All the larger and many of the smaller islands lying east of Santa Ysabel were discovered. Between January and August most of them were visited and formally taken possession of for the King of Spain. Then, on the 11th of the latter month, after a discussion by the whole company of the question of returning to Peru or settling in the islands, the expedition started to return. It took back with it no treasure or valuables of any sort found in the islands. But six unfortunate islanders were carried off. Their abduction, in the eyes of their kidnappers, was doubtless more than atoned for by their being taught to profess the Christian faith. Prevailing head winds hindered the ships from sailing due east to Peru or south-east to Chile. Their course was therefore directed north, then east, for New Spain. On the way they parted company. Overtaken in the North Pacific by frightful tempests, they more than once were near foundering. Battered, mastless, with the supply of mouldy biscuits (all the food left) nearly exhausted, and the water tanks empty, the larger vessel sighted the shore of Lower California on the 19th of December, and entered the Mexican port of Santiago de Colima on the 23rd of January 1569. There she was on the same day joined by her consort in an even worse plight. After much delay, and having put in at a number of Spanish ports on the southward journey, the ships arrived at Callao on the 11th of September 1569.

The company which landed at Callao was, according to the chief purser's lists, upwards of sixty short of that which set out. Thirty-two men had deserted or been discharged at the American ports visited; twelve were killed in encounters with the Solomon Islanders, eight died of fever in the islands, and ten (from scurvy) on the homeward voyage. None of the leaders lost their lives, but two were at death's door when they reached Colima. The marvel is that the expedition ever returned to give an account of itself. That it did speaks at once for the courage, hardihood, and discipline of these sixteenth century mariners

and soldiers, and for the intelligence, skill, and resourcefulness of their leaders. With the exception of Pedro Sarmiento, the whole company worked fairly well together. Mendaña, notwithstanding his youth, maintained the authority of his post, and, backed by most of his colleagues, tactfully controlled the movements and conduct of his subordinates. The disasters met with were in few instances due to folly, rashness, and want of forethought. Ignorant of the currents and winds of the treacherous ocean through which they sailed, trusting for their latitude to dead reckoning, provisioned for a voyage of 600 leagues and expecting then to come upon a country where food would be abundant, in place of one where they were able to lay hands upon only a limited amount of it after stout opposition from the able-bodied and suspicious inhabitants, the leaders and their men nevertheless effected, and kept record of, much geographical exploration, and found their way home after grievous disappointments and "in the teeth of every hardship which seamen can have to encounter." It may well be said that "the voyage was one remarkable even in a century famous for maritime discovery."

The six narratives in these volumes were written or dictated by members of the expedition. They consist of two by Mendaña, one by Gallego, one by Catoira, and the others by anonymous authors. One of the last is surmised to be Sarmiento's. At any rate its writer takes Sarmiento's side in his differences with Mendaña. The sixth is interesting, not only intrinsically for its contents, but also as showing that the ships' company included at least one observant and educated member besides the leaders. The narratives, differing more or less in elaboration and incident, present a wonderfully unanimous history of the expedition. Gallego's deals chiefly with the nautical features. The manuscript of Mendaña's longer narrative has in part been lost. But Catoira's account, which, with variations in details, is not less full, is fortunately entire. It fills nearly the whole of the second of the volumes before us. Catoira was in fact a much interested and highly intelligent observer and recorder of what he saw and heard. He must have kept a careful journal throughout; and being possessed of considerable literary faculty and humour, he was able to compile after the voyage an account replete with graphic touches and descriptions. A striking characteristic of all the narratives is their general cheerfulness. Scarcely anywhere is expression given to the disappointment which must inevitably have been felt by some at least of the authors—that in its main purpose, treasure and conquest, the expedition had utterly failed. Naturally the official narrators, themselves the leaders, avoided giving emphasis to this fact: Mendaña at least, remained an enthusiast still.

The exploration of the islands was carried out mainly in a small vessel (brigantine) built under Gallego's supervision immediately after the expedition reached Santa Ysabel. She was undecked and of four or five tons burden. In her three coasting voyages of from two to five weeks each, under the command of Ortega, Henriguez, and Gallego, she carried about thirty sailors and soldiers, with stores, arms and ammunition, and a culverin. Only in such a boat could the coast have been explored. Even in her, overcrowded as she must have been, the navigation of the reef-girt

shores, in uncertain winds and currents, tested Gallego's seamanship. The explorers were constantly harassed by the necessity for procuring supplies and fresh water from the land, and for impressing the natives with a wholesome dread of their fire-arms. It was these only that secured the brigantine against being surrounded and her crew from being overpowered by the swarms of native war canoes. The vigilance of the shore parties was always on the stretch to anticipate and meet the devices and attacks of the islanders. Apprehension of being killed *and eaten* was seldom absent from their minds. Yet the accuracy of the geographical exploration carried through amid these difficulties has been amply attested by Mr. C. M. Woodford and other modern explorers.

Moreover, these sixteenth century voyagers, intent mainly upon treasure and territory, were not trained observers of men and manners of the modern type. Their communication with the natives was mostly by gesture and signs. Belonging to a nation of bigoted propagandists they were likely to look upon the ways and works of the cannibal pagans as little worth describing. Nevertheless, the authors of the narratives put on record, with the spirit of genuine investigators, much which recent observers like Dr. Guppy and Mr. C. M. Woodford have shown to be noteworthy regarding the manners, customs, and language of the islanders as well as the products and condition of the islands. The customs and characteristics of the islanders are at the present day found to be what the Spaniards described them: the indigenous products utilised and cultivated, the native implements and weapons, are practically the same. Certain tracts then populated are now desolate. But internal warfare, prevalent in the Spaniards' time and often referred to by them, and head-hunting raids from New Georgia and other islands in later times, account for this. To the credit also of most of the Spanish leaders be it said that although after experiencing the intractable and bloodthirsty nature of the islanders and the pressure of their own needs, their methods became scarcely justifiable, they at first approached the natives and endeavoured to overcome their timidity and fickleness in a kindly and forbearing spirit.

The crowning misfortune of so much enterprise and travail, productive as they had been of no immediate gain but only of loss, was that they were destined to be fruitless. The narratives, indeed, promised little to the sixteenth century exploiter of land and people. Yet in 1595 Mendaña was again commissioned to lead a colonising expedition westwards from Peru. But he failed to find the islands, and the expedition ended in disasters, including his own death. Ten years later another expedition led by Quiros, chief pilot in Mendaña's second voyage, was equally unsuccessful. It was not till 1766-69 that Carteret, Bougainville, and Surville, coming from the west, successively rediscovered one or other of the larger islands: not till 1785 did French geographers in Europe identify them as the Solomons of Mendaña. A hardly less untoward fate befell these written accounts. More than once copied, they remained stored away in public and private libraries in Europe. It was reserved to the nineteenth century to see most of them separately printed or translated, and to Lord Amherst of Hackney and the Hakluyt Society

in 1901 to bring together in worthy form complete translations of them all.

It is idle to speculate as to the probable result of an effective Spanish occupation of the Solomon Islands in the sixteenth century. The yoke of Spain lay heavy on her great trans-oceanic acquisitions. A kindly providence doubtless preserved the Solomon islanders then and for three hundred years more from attempts at subjugation or serious interference by the white man. The whole group of islands (Bougainville excepted) has at length come definitely under a British Protectorate, with a resident Deputy Commissioner, one of whose functions is the safeguarding of the personal, trading, and landed rights of the natives. From his last report it is gratifying to learn that the commerce of the islands is growing, and that while the number of foreigners living on the islands has increased, three years have passed without any white man being murdered by the islanders. The interior of the larger islands is still unexplored: their mineral resources are still unprospected. Their future, therefore, cannot be forecasted. But few readers of these volumes will fail to have their interest in the Solomon Islands awakened, and to hope that from a wisely controlled contact with civilised men, the inhabitants may in time become docile and humane, and that to them will accrue a large share of the gain arising from the development of the islands' resources.

The Hakluyt Society has done well in issuing these volumes. The Spanish texts have, after much labour in deciphering and collating, been translated into most readable English and fully annotated. They have been prefaced with an excellently written introduction by Mr. Basil Thomson, and followed by an elaborate index. Two very complete maps and a large number of fine illustrations elucidate the narratives. In his preface to the work Lord Amherst of Hackney acknowledges his indebtedness to those who have aided him. To himself the indebtedness of all interested in geography and anthropology is much greater.

NOTES ON GEOGRAPHICAL EDUCATION.[1]

By A. J. Herbertson, Ph.D.

1. *Examinations.*—It used to be supposed—and in some quarters it is still supposed—that anybody can teach geography without any training, and even without any knowledge beyond the scrappy information obtained at school. Under such conditions the geography lesson is naturally disappointing both to master and pupils. A common remark of many headmasters is that geography is of no use for educational purposes, and is included in the school curriculum because the parent demands it, and some examination authorities have recognised it. For many parents and examining bodies the purpose of geography is to

[1] The first of a series of notes on matters of current interest in geographical education: other articles will appear from time to time.

teach children where places are, and both are contented when this is attended to.

I shall be told that this is a description of the past, not of the present, and no doubt this is the case as far as the teacher who makes the objection is concerned. All teachers have not learned to teach geography rationally. It does not pay them to do so, is the reply.

Unfortunately there is some truth in this rejoinder. A recent analysis of examination papers, published in the first number of the *Geographical Teacher*, shows that in the preliminary examination paper, set by both Oxford and Cambridge local examiners for about nine thousand pupils in secondary schools, not a single question involved any reasoning whatever; and in the junior examination paper, set for nearly thirteen thousand candidates, the conditions were not much better. The higher papers were not so objectionable.

We are in a transition period of geographical teaching. These local examination papers represent the old traditions. In others mentioned in the same article the wiser and more rational conceptions of geography are more in evidence, and questions of the type set by the Royal Scottish Geographical Society's examiners, which may be seen in back numbers, occur.

The teacher is in a difficult position. The syllabus may be excellent, but if the examiner has no sympathy with it, and has never thought of geography as more than an informational subject, the paper is sure to be disappointing to both teacher and pupils, enthusiasm is checked, and improvement arrested. That is no excuse for return to bad, routine methods, which involve less trouble. The lazy teacher has his excuse ready. So has the lazy examiner, who differs from the man oblivious to any improvement in methods of teaching geography. The lazy examiner is he who knows what is right, and does it not because rational questions, as a rule, require more thought, and also more time to correct than topographical lists, and he is inadequately paid for his dreary work as it is. He tells us that there is no good asking rational questions as the children are not taught rationally at school, that consequently none of them would get any marks, and that the examination authorities would have a bad quarter of an hour when the results were published.

There is just a little truth in this contention. I have spoken to a number of examiners in geography, and we are all agreed that the answers to the questions involving reasoning are, as a rule, very disappointing. In the present conditions in public competitive examinations it is necessary, in the interests of fairness, to pass gradually from the older to the newer tradition, with rather more of the new than of the old. Evidences that this is being done can be traced in many civil service and other examination papers.

The cases of the papers set by examiners for the Education Departments and the Universities are different. These bodies are not concerned merely with selection of suitable mandarins. Their problem is not merely to test the individual but to encourage sound methods of teaching. The method of doing this through examination papers set to thousands of candidates from all parts of the country is of course most

unsatisfactory. As long as it prevails, however, it ought to be utilised. The papers should be so framed that they demand trained intelligence rather than a vast memory for satisfactory answers. Only in this way can all manner of schools be treated fairly and rational teaching encouraged.

2. *Geography at the Universities.*—When we speak of applied geography we too often limit the term to commercial applications. Educational applications of geography are even more important. As nearly every teacher has to use geography as one medium of education, it is natural to expect that much stress will be laid on geography applied to education—that teachers will be trained in the science of geography in general, and in its applications to education in particular. Gradually this is being recognised, although I am informed that in some Scottish training colleges there is no geographical department. The universities must take the lead in this matter. This is not the occasion to write about the scope of a geographical department of a university, but it is opportune to point out that in all universities future teachers are being trained, and that they cannot obtain adequate training in this subject outside the two oldest English universities. In this matter of geography Oxford has made greater progress than any other English-speaking university, and its special diploma granted after a year's work at the School of Geography is designed to meet the requirements of teachers as well as of many others whose work involves a knowledge of geography, while the research B.Sc. is open to geographical students who can fulfil the preliminary conditions. The syllabus for the diploma is so drawn up that a candidate can within reasonable limits specialise in the geographical aspects of his own special subject, be it classics or history or natural science. Full particulars may be obtained by writing to the Curator, School of Geography, Oxford.

The Victoria University for some years has been in advance of the others in permitting geography to be chosen as an optional subject for the ordinary pass degree. Now the new University of London has recognised geography in its economic aspects, and made it an optional subject in the examination for the B.Sc. in economics.

3. *New Magazines.*—The appearance of two new magazines written for teachers of geography is a cheering sign. The Geographical Association, to which all teachers of geography should belong,[1] has published the first number of the *Geographical Teacher*, which will be issued three times a year. It is devoted entirely to papers, notes, and reviews of geographical subjects of interest to teachers as teachers. No. 1 contains articles on Methods of Teaching Geography, Limitations and Possibilities of Geography in Day Schools, Difficulties in Lower School Geography, The Use of Maps in Teaching, Photography as an Aid, School Excursions, The Teaching of the Configuration of the World, Notes on Books and Papers about the British Isles, Notes on Recent Maps and Apparatus, and the article on Examinations already referred to.

[1] The annual subscription, five shillings, should be sent to the Honorary Treasurer, Mr. J. S. Masterman, St. Margaret's, Dorking, and teachers should state the name of their school and their position in it.

It is interesting to contrast this Table of Contents with that of the Austrian Quarterly (*Vierteljahrshefte für den Geographischen Unterricht.* Wien, Hölzel. 10 M. per annum), edited by Dr. F. Heiderich, which is more than double the size of the British magazine. The chief articles are—Biogeography in School Teaching, Mathematical Geography as intermediate between an empirical and mathematical science, Historical Atlas of the Austrian Alps, and the question of representation of relief, The Relief of the Bed of the Adriatic, with a map, Report of School Geography Section of the Thirteenth Congress of German Geographers. There are a number of short articles, numerous notes on current geographical papers and other works, and reviews. In short, the new Quarterly resembles this *Magazine* much more than the *Geographical Teacher.* Some of the articles we propose to notice in a future number.

The American *Journal of School Geography* has amalgamated with the *Bulletin of the American Bureau of Geography*, and will now appear as the *Journal of Geography.* The Editors are Professors Dodge, Goode, and Sehnerts.

PROCEEDINGS OF THE ROYAL SCOTTISH GEOGRAPHICAL SOCIETY.

Meetings in April.

On the 3rd April, in Edinburgh, the Rev. Thomas Lewis read a paper on "Life and Travel among the People of Congo." The Chair was taken by the Rev. Dr. James Stewart of Lovedale.

Mr. Lewis repeated his address to the Glasgow Branch on the 7th, when Dr. Robert Gourlay presided.

Meeting of Council.

At a meeting of Council held on the 2nd April the following new member was elected, viz.: David Russell; and the Ordinary Diploma of Fellowship was conferred on Mr. Alexander Macdonald.

The Council passed a resolution recording its sense of the loss sustained by the Society through the death of Mr. James A. Wenley, who had acted as one of its trustees since 1893. The Council also recorded its regret at the death of Mr. L. F. U. Garriock, a Member of Council who represented the Dundee Branch.

OBITUARY NOTICE.

CECIL JOHN RHODES

(Born 5th July 1853; Died 26th March 1902).

Long ago Thomas Carlyle told us that "Universal History, the history of what man has accomplished in this world, is at bottom the history of the great men who have worked here. They were the leaders of men,

these great ones; the modellers, patterns, and in a wide sense creators, of whatsoever the general mass of men contrived to do or to attain; all things that we see standing accomplished in the world are properly the outer material result, the practical realisation and embodiment of thoughts that dwelt in the great men sent into the world; the soul of the whole world's history, it may justly be considered, were the history of these." Weighed in this balance, Cecil John Rhodes was unquestionably a hero, and one of the great men of the world. The word "impossible" was not to be found in his dictionary. Handicapped by bad health, unassisted at first by wealth or high social position, he followed the advice of the wise man, and whatsoever his hand found to do he did it with all his might. Essentially a man of action, swift to decide, and prompt to execute, he was an idealist, yet with clear and well-defined views of what were his inevitable limitations; a patriot, who understood well and estimated aright the mind of England, and, sure of the greatness and rectitude of his purpose, he was content to meet with opposition and misconstruction, convinced that in the long run he was certain of success. He had a wise appreciation of the use and power of wealth—a millionaire whose personal expenses were insignificant, he lavished millions on any cause which he deemed just and advantageous to the Empire. For, of course, it is as an Imperialist that the name of Cecil Rhodes will remain in history. In course of time such incidents as the Jameson Raid and the Parnell Cheque will be forgotten, but the grand part played by Rhodes in the drama of South Africa will stand out brighter and brighter. It may not be claimed for him that he originated Imperialism, as it marks the last quarter of the nineteenth century, but no one more than Rhodes, has contributed to its development, or has done more to make it successful; and few, if any, were prepared to go the lengths which he was prepared for, to realise Imperialism in the widest meaning of the word. His whole mind and energy were set on the problem of ensuring and confirming British supremacy in South Africa, but this was only one part of his grand conception of a British Empire to include all the colonies and dependencies as one compact, irresistible power, which should control the destinies of the world, and make for peace, prosperity, and righteousness. For this he laboured with a strenuous zeal and buoyant hopefulness which made light of difficulties before which brave and able men might well have recoiled in dismay. Idleness for him was an impossibility. Even when shut up within the Boer lines in Kimberley, his untamable energy found scope and material on which to expend itself. Cut off at the comparatively early age of forty-nine, he was not destined to see his ideals realised, but he had the happiness to feel assured that their realisation is merely a question of time. Imperialism as a political and national force has come to stay: the extinction of Afrikanderdom as a power antagonistic to British supremacy in South Africa is within measurable distance; the railway from Capetown to Cairo will assuredly be completed; South Africa is clearly destined to be a second India, an integral part of the Empire, but in some respects more valuable and greater in importance than her Eastern rival.

Of Rhodes as a man it is hardly yet the time to speak, but no one who came within the range of his personality could fail to be fascinated by its strength and charm. His detractors (and, being a truly great man, he has many) may criticise this and insinuate that, with regard to motives or incidents in his career. The strong and just good sense of his countrymen and posterity will know how to brush them aside. His personal bravery, at any rate, cannot fail to secure the admiration of friend and foe. England must be proud of the man who walked unarmed and alone into the tent of Delarey on the Hartz river and calmly discussed boundary questions, ignoring the fact that his own life was in danger. Of a similar nature, but still more daring, was his famous interview with the rebel Matabele chiefs in the Matoppo hills, where his sole weapon was a riding-whip. And it was a brave act to join his fortunes with the beleaguered garrison of Kimberley, when he knew that his presence in the town would incite the Boers to do their very utmost to take it. Not less remarkable on various occasions has been his display of moral courage when he had to face adverse circumstances and acknowledged enemies. Conspicuous among these was his appearance when virtually put on his trial before the Parliamentary Commission which investigated the Jameson Raid. There he was in the wrong, and he knew it; but his courage never once forsook him, and ere he had been a short time under examination he had triumphed over his accusers by dint of sheer personal influence and charm. Untrammelled by domestic ties, he was able to devote his whole genius to public questions, for, although finance and the acquisition of wealth unquestionably occupied much of his time and attention, they were always subordinate and ancillary to his political and imperial aspirations. The very terms of his will, written some three years before his death, bear eloquent testimony as to what these aspirations were. He longed and laboured for British supremacy in Africa, the solidarity of the Empire, and peace throughout the world. Perhaps we may not say that "his life was gentle," but we certainly can claim for him the rest of the eulogium, viz.:—

> "the elements
> So mixed in him, that Nature might stand up
> And say to all the world, 'This was a Man.'"

GEOGRAPHICAL NOTES.

EUROPE.

Survey of British Lakes.—Sir John Murray has now taken up his residence at Rannoch Lodge, which place he has rented from Sir Robert Menzies, Bart., from the present time till the commencement of the shooting season. From Rannoch Lodge, standing at the west end of Loch Rannoch, as a centre he will commence the investigation of the lochs in that district, and in the first week of April the following gentlemen joined him, and will be associated with him in the work, viz.: Mr. R. M. Clark, B.Sc., Aberdeen; Mr. T. N. Johnston, M.B., C.M., Edinburgh; Mr. James Parsons, B.Sc., London; and Mr. James Chumley, Edinburgh.

Other appointments will be made later in the season. Sir Robert Menzies, who has taken a great interest in these investigations, and has placed boats, etc., at Sir John Murray's disposal for carrying on the work, has said that all Highland proprietors should render any assistance in their power to the survey by offering the use of boats.

It is intended to include within the scope of the survey, in addition to the systematic, physical, and biological investigations, observations regarding the oscillations in the level of the water (phenomena called "seiches" by Prof. Forel) by means of self-registering "limnographs," which will be set up on the shores of the larger lakes. The first limnograph is now in process of construction in Geneva under the personal supervision of Prof. Ed. Sarasin of Geneva.

It will be remembered that Mr. Laurence Pullar of Bridge of Allan has set aside funds to aid in carrying out this Survey, as a memorial to his son, the late Mr. Fred P. Pullar, who was engaged (in collaboration with Sir John Murray) in a systematic survey of the Scottish lakes at the time of his accidental death in February of last year.

Afforestation of Ireland.—In connection with the appeal for the afforestation o Scotland by Mr. Marcel Hardy, which we publish this month, it is of interest to note a letter from Mr. W. Schlich to the *Times* of March 26th on the possibility of planting in Ireland. Mr. Schlich points out that in county Galway only 25,000 acres (2 p. c.) are covered by woods and plantations, while there are 485,000 acres (32 p. c.) of waste land. He believes that of this 100,000 to 200,000 acres are fit for planting. Taking the lower figure, the cost of planting would involve labour valued at say £300,000. If this expenditure were divided over twenty years, the community would benefit greatly during the years of planting, and at the end of the time work in the forest would commence and go on increasing.

Of late years the British imports of timber, apart from wood-pulp, have been valued at £25,000,000, and this imported timber includes a large amount of birch, which is used for bobbins. Ireland is perfectly suited for the growth of birch. is similarly well suited for spruce and Scotch pine, from both of which wood-pulp is made. If there was in Galway a sufficient and steady yield of spruce and Scotch pine timber there is no reason why pulp factories should not spring up, especially in the regions where water-power is available. Again, as Mr. Marcel Hardy has pointed out in his paper, there is every reason to fear that the world's supply of timber is decreasing, and may soon cease to be sufficient to supply its needs, which is another reason for early planting.

Mr. Schlich suggests that the Irish Government should experiment in say county Galway by setting aside as state forest areas the land which remains over when large estates are bought and broken up into small holdings. Several precautions would have to be taken in the process, not only in seeing that the right trees were planted, but also in taking care that the forest areas were of relatively small size and in the vicinity of cultivated land, so that the small farmers could work in the forests during slack seasons without having to leave their homes.

Surface Relief of Norway.—Dr. Hans Reusch publishes a map of the southern part of Norway to illustrate the main features of its physical geography. Of all the submerged valleys or fjords of its coast the most developed is the Sognefjord, and its inland ramifications are surrounded by the highest mountains of the country. To this mountainous region the author gives the name of the Storfjelds, and as his map shows, it forms a vast cirque draining into the fjord. The

eastern slope of the Storfjelds bounds the large south-eastern basin of Norway, whose waters converge towards the fjord of Christiania. The position of the capital has been determined by topographical conditions, for it is situated at the point where ships can penetrate farthest into the land. The southern region of Norway is formed by the drainage basins included between the Langesund and the northern entrance of the Hardanger Fjord, and from its radiating fjords should geographically be a region of small towns. The predominance of Bergen among these has no geographical justification, and an explanation is to be sought rather in history than in physical conditions. From the Sognefjord northwards stretches a coast-line cut by many fjords, while in the vicinity of Trondhjem is another depressed region towards which many fjords converge. The position of the town has been determined by these converging valleys. The high grounds and basins themselves find their explanation in the geological structure of the country.—*La Géographie*, v. (1902).

Physical Geography of Iceland.—Sir Archibald Geikie gives in *Nature* an interesting account of Thoroddsen's new Geological Map of Iceland (Copenhagen, 1901). In the great extent of its basaltic plateaus of Tertiary age, Iceland shows considerable geological resemblance to the western coast of Scotland. From Reykjavik right round the western, northern, and eastern sides of the island, this plateau meets the sea ; and its margin is cut into fjords and inlets, above which rise lines of terraced cliff. Along the southern coast, on the other hand, the coast consists for the most part of beaches of fine sand and mud, brought down by the streamlets which escape from the glaciers and snowfields. So vast has been the load of detritus brought down in this way, that for a distance of some 250 miles the land is encroaching on the sea, and in spite of the force of the Atlantic breakers, not only has a wide stretch of lowland been gained, but beyond it the sea has been shallowed for a great distance from the shore. This new land is however of little practical use, for not only is it too liable to sudden flooding to be safely reclaimed, but in one region, that nearest to the Myrdal glaciers, the eruptions of Katla form an additional source of danger. This vent is buried beneath snowfields, but now and again becomes active, and, disrupting and melting the superincumbent ice, sends down great floods of water and ice-blocks to devastate the plains. To both geologist and geographer, indeed, the country is one of surpassing interest, for the effect of snow and ice and of volcanic forces, elsewhere widely separated, may here be seen in combination.

Geography of the "Landes" of France.—Dr. M. C. Engell gives in *Petermann's Mitteilungen*, xlviii. (1902), an exceedingly interesting account of this region. Geologically the Landes constitute one of the most recent parts of France, being of Pliocene or perhaps post-Pliocene age. The climate is warm, and the vegetation of the Central European type. The area of the Landes extends from the Garonne to the Adour and from the sea to the Gélise, and includes approximately 14,000 kilometres. Two types of land forms can be distinguished, the peripheral dunes and the level heaths behind them. Apart from the Basin d'Arcachon the coast-line from the mouth of the Garonne to south of the mouth of the Adour is singularly devoid of bays or inlets, and forms an almost straight line. In this respect it resembles the west coast of Jutland. Within the coast-line lies the belt of dunes which from their height (70 metres above the level of the plain) almost merit their local appellation of mountains. They consist of fine quartz sand, and are apparently of very recent formation. Until the modern attempts at planting they were advancing rapidly on the interior, but have now been fixed by

means of an abundant growth of *Pinus maritimus* mingled with bracken fern, whin, and broom. The forests of *Pinus maritimus* so produced yield a large amount of resin, from which turpentine of high quality is made. The formerly unproductive and indeed destructive dunes have thus been made to yield products of value to man. Behind the dunes lie the heaths floored with yellowish quartz-sand which is almost devoid of clay: clay is present only in the deeper layers and is there unmixed with other substances, lime being absent. There is but little humus, and a large amount of iron oxide is present. But the great difficulty in the way of the utilisation of the soil by the agriculturist is the presence, at varying depths beneath the surface, of a layer of impermeable siliceous conglomerate, called *alios* by the inhabitants. The presence of this layer prevents rain from sinking into the ground, and the want of fall between the heaths and the sea is an obstacle in the way of adequate drainage, so that the land is by turns flooded and dried up. Where the impermeable layer is some distance below the surface, the cultivation of maize, the vine, and wheat becomes possible over small areas: elsewhere the conditions are frequently those of a desert. The characteristic plant is *Erica scoparia*, but attempts have been made to plant trees and convert the heath into a forest land; *Pinus maritimus* and cork-oak have been planted with success, and are yielding products of commercial value.

ASIA.

Eighteenth Century Journey to Lhasa.—Signor A. Magnaghi, in the *Rivista Geografica Italiana* for November and December 1901, gives an abstract of an unpublished MS. by Cassiano Beligatti of Macerata, a Capuchin missionary who journeyed to Lhasa early in the eighteenth century. During this century the Capuchins had for many years flourishing missions at Lhasa. In their journeys thither the missionaries were in the habit of avoiding the main roads in order to escape the exactions of the Mogul officials, and it has not always been possible to identify the halting-places of the padre, but his account of his journey contains interesting descriptions of the country passed through.

Navigation of Upper Yangtse.—In connection with Mrs. Little's paper on this subject, read before the Society, and reported in our March number, attention should be called to an article in *La Géographie*, v. 1902, by Pierre Boris d'Anty. After a summary account of the part played by the different explorers in opening up the river, the author concludes by describing the commercial benefits which may be hoped for by the systematic opening up of the rich province of Szechuan to trade by means of a service of steamers on the Upper Yangtse.

Indian Cosmography.—Dr. Francesco L. Pullé has compiled from various sources an interesting and exhaustive account of the development of Indian Cosmography. He summarises the views held by Indian and Thibet Buddhists, by Persians, Alexandrians, and European geographers, beginning with the Indian conception of the globe as a square with Mount Meru, or Jambu-dvipa in the centre, and gradually developing into the peninsular form. That this was Pliny's view of the shape of India may be inferred from his writings. Besides the illustrations in the text, a separate fasciculus contains various maps bearing on the subject, some of Cosmas Indicopleustes, one by the anonymous geographer of Revinna, and a reproduction of Kiepert's interesting map showing the knowledge of India possessed by the Ancient Greeks.—*Studi Italiana di Filologia Indo-iranica*, iv.

AFRICA.

Cape Verd Islands.—J. Thoulet gives an account of two brief visits paid to the islet of Branco in this archipelago. The island is of volcanic origin, is uninhabited because totally devoid of water, and measures some three miles in length with a breadth of one mile. The author found some strata containing remains of marine organisms, and on the basis of his observations gives the following account of the origin of the island. The first event was a volcanic eruption below sea-level at a depth which, as proved by the nature of the organisms entombed in the volcanic material, was only slight. The centre of the present islet then rose above the waves, carrying with it the sea-bottom which covered the volcanic vent. Once elevated it began to crumble away under the joint influence of atmospheric agents and the volcanic phenomena, so that round the shores of the original islet there was produced a submarine plateau of sand and gravel formed of land debris mingled with fragments of shells and calcareous algæ. Finally, slow movements of elevation raised these beds of sand above sea-level, with but little disturbance of their horizontality. During the process emanations of volcanic gases and vapours played an important part in inducing metamorphism in the sandy deposits. In regard to the famous calcareous deposit described by Darwin at Saò Thiago, and noticed by Doelter at Maio, Thoulet cannot agree to the hypothesis of the latter that this is the remains of an original land-surface rent and elevated by volcanic eruptions. He believes that as in the case of the similar deposits at Branco, this bed is an elevated submarine deposit, enveloped and metamorphosed by volcanic rocks. All the islands of the archipelago have probably arisen after the same fashion as Branco.—*La Géographie*, v.

Island of St. Thomas.—Signor Fea has spent a few months on this island, and gives some notes of his impressions. When first discovered in 1470 or 1471, the island was uninhabited, but it was peopled in the following century from the wreck of a slave-ship. At a later date a scarcity of women was redressed by a raid on the plantations of the neighbouring mainland, recalling the Rape of the Sabines. The present population numbers about 35,000, of whom one-half are "serviciæ," *i.e.* are recruited on contract from the neighbouring Portuguese territory of Angola. The status of these is hardly distinguishable from slavery. There are about 2000 whites, but owing partly to neglected sanitation the rate of mortality is high—not less than 15 per 100. Economically the colony is valuable and productive, the chief staples being coffee and cacao. In 1899 the exports of coffee from St. Thomas and the adjacent island of Principe were 1,555,000 kilos, of cacao 11,028,000 kilos; the amount of coffee seems to be increasing while that of cacao is decreasing. Signor Fea's object in visiting the island was to study the fauna. He found that apart from the birds the indigenous vertebrates are few in number; of birds there are sixty species, fourteen being peculiar to the island. Among invertebrates only the land molluscs are comparatively numerous and form a contrast with the general poverty.—*Bollettino, Società Geografica Italiana*, February 1902.

AMERICA.

American Biological Stations.—In view of the increased interest which is being taken in this country in the establishment of Biological Stations, attention should be called to a memoir published in the *Bulletin of the New York State Museum* in September last, on the Aquatic Insects of the Adirondacks, by two gentlemen who spent ten weeks at the Entomologic Field Station at Saranac Inn. The primary

object was the study of the food-supply of fresh water fishes, but the report presented is on a small scale an admirable biological survey of the district in question, conducted along the lines already advocated in this *Magazine* in the case of the Forth area. Short as was the time at the disposal of the two authors—Prof. J. G. Needham and Mr. Cornelius Betten—they have managed to produce a large amount of admirable work, and what is perhaps even more important, their report is so arranged as to show how many lines of work lie open for the future. This is no isolated case, for everywhere the Americans are showing themselves alive to the necessity for regional surveys, and everywhere those interested seem able to command funds for equipment and endowment. Britain contains now not a few marine biological stations, but as yet there is no fresh-water station of this kind.

Giant Trees of California.—Our corresponding member, Mr. Henry Gannet, informs us that the article on this subject in *Petermann's Mitteilungen*, of which an account was given in our March number, is in several respects incorrect, and he sends us the following note on these trees :—

The California Big Tree, or *Sequoia Gigantea*, is found only upon the western slope of the Sierra Nevada at altitudes ranging from 4000 to 7000 feet above the sea, and between the latitudes of 36° and 38° North. Here it occurs in ten isolated groves, the number of trees in each grove ranging from twenty-four up to several thousands. The tree never occurs in pure growth, but always as a minor component of the forest, with yellow and sugar pines as the prevailing trees. It is probably the largest tree on earth, many individuals exceeding 300 feet in height and 30 feet in diameter, with a clear stretch of 150 feet to the lowest branch. The bark has a thickness of 15 to 18 inches, and is soft, corky, and porous, so that pieces of it are used as pincushions, and mattresses are stuffed with it. It is doubtless the oldest living thing, although exact measurements of the age of the oldest and largest trees have never been obtained. Such measurements as have been made indicate a maximum age of 5000 years or thereabouts.

The old trees, and most of them are old, have the aspect of old wrecks. They are fire-scarred and burnt at the base, the tops and branches are broken, and they have a general air of venerable, battered old age. In a few exceptionally moist places are to be seen trees in the prime of life, and here and there a few seedlings and saplings. The scarcity of young growth, however, is noticeable, and is indicative of the fact that the tree has outlived its environment ; that the climate has become too warm or too dry, or both, for its development.

With the exception of the Calaveras and Stanislaus groves, all of these groves are included within national or state parks or forest reserves. These reservations were not, however, made early enough, and the majority of these trees have become the property of private individuals, some of whom are actively engaged in cutting them up for lumber. The lumber is inferior for most purposes, and the lumbering process is attended with great waste.

This tree, and the redwood, *Sequoia sempervirens*, which occupies a narrow strip along the California coast, mainly north of San Francisco, are the only living representatives of the genus. They are coniferæ, related most closely to the Bald Cypress of the southern states.

With his paper Mr. Gannet has sent us a photograph of the "Grizzly Giant."

Amazon Region of South America.—Our corresponding member, Mr. R. Hay Anderson, has sent us a full report, from the *Mexican Herald*, of a paper read by General Rafael Reyes before the Pan-American Conference in December last.

General Reyes gave a very full and interesting account of his early explorations in the Amazon region, which were undertaken in the company of his two brothers, both of whom fell victims to their zeal for the increase of geographical knowledge. In his first journey, General Reyes started from the town of Pasto, and descending the eastern slope of the Andes, traversed regions then quite unknown, crossed the country inhabited by the tribe of Mocoas, and finally struck the river Putumayo, which he found to be navigable for steamers of a nine-feet draught over much of its length. His party descended this river till it enters the Amazon, and then continued their journey down that river to Para, General Reyes being the first white man to cross the continent from the Pacific to the Atlantic seaboard. From Para, Reyes subsequently reascended the river Amazon in a steamer, and entering the Putumayo sailed up it until he reached the limit beyond which steamer navigation becomes impossible, a point which he named La Sofia after his wife. Subsequently the Putumayo was connected with the city of Pasto by means of a road. This and subsequent explorations have resulted in the opening up of a number of waterways to steamer traffic. General Reyes gave a glowing account of the agricultural and mineral resources of the Amazon country, and of the results to be expected from the projected inter-continental railway which would pass through Pasto. By means of branch lines the main trunk could be readily made to communicate with the immense system of waterways formed by the Amazon and its tributaries, a system to which General Reyes gives the name of the Mediterranean of America. If this were done, the development of the region would be rapid.

AUSTRALASIA.

Conditions of Existence in Australia.—M. Vigouroux has communicated to the Société de Géographie a paper on the geography of Australia considered in relation to the economic, political, and social life of the community, which is thoroughly representative of the modern geographer's point of view. He first summarises the physical conditions, pointing out how the central depression and the very gentle slope of the great granitic plateau account for the well-known absence of rivers and waterways over so much of the continent. At the time of its colonisation much of the Australian area was covered by forests especially of eucalyptus, and the removal of these has led to the growth of excellent fodder over much of the country. In consequence it has proved admirably adapted for the rearing of stock, while the uncertainty of the rains and the difficulties of irrigation have been a barrier in the way of agriculture. But in Australia as everywhere the pastoral life means a scattered population, and the rapid occupation of vast tracts of land, which are required to support the flocks and herds of the settlers. In a country where navigable waterways are virtually non-existent, and the sea affords the only natural means of intercommunication, the effect of this again is to produce difficulties of administration, in at least the earlier stages, whence we have the establishment of five originally independent colonies within the continent—the political effect of the surrounding geographical condition. M. Vigouroux goes further than this and traces the effect of the climate upon the habits and customs of the Anglo-Saxon race in Australia in detail. Some of his conclusions in regard to these points suggest that the method adopted has its dangers, and may be made to explain too much.—*La Géographie*, v. (1902).

Australian Exploration.—Our corresponding member, Rev. J. Bryant, informs us, under date of January 7th, that after a six months' exploration of unknown territory between east and west Kimberley, Mr. F. S. Brockman of the West

Australian Land Department has returned to Perth. He was instructed by the Government to look for gold-bearing country or pastoral areas. The exploration has been unhurried, and so complete has it been in detail that this unknown portion of Australia can now be satisfactorily marked on the map.

Mr. Brockman states that although no mineral-bearing country was found, there are immense tracts of splendid pastoral country. It was the worst part of the year, and yet the grass was abundant. This country is sheltered from the north-west coast by a high range of sandstone hills, and the climate is far superior to that of the Kimberley district. Excellent ports are convenient to it, notably Napier and Broome Bay. Mr. Brockman reckons at a low estimate that six million acres of most excellent pastoral land are available, with a probable rainfall of 40 inches a year and numerous rivers and streams.

Natives were encountered in small numbers. Mr. Brockman does not think they are pure aboriginals but a mixture of Malay with the Australian native. A large number of rock paintings were seen, some very well executed. Bird and animal life was abundant, and some hitherto unknown specimens were secured.

POLAR.

German South Polar Expedition.—Despatches have been received from Professor Drygalski describing the journey of this Expedition to the Cape. Porto Grande on São Vincente was reached on September 11th last, and the island was not quitted until September 16th. The course was then set for Ascension, but owing to cross seas and contrary winds very little progress was made, and on the 7th of October the course was changed and set direct for the Cape, which was reached on November 23rd. Thence on December 7th the expedition set out for Kerguelen, where it arrived on January 2nd, leaving again on the 31st for Termination Island. All on board were reported well.

Letters from Dr. J. J. Enzensperger report the progress of the *Tanglin* from Sydney to Kerguelen. The *Tanglin* left Sydney on October 12th, but owing to stress of weather did not make Three Island Harbour till November 9th. The dogs stood the journey well in spite of storms, only three dying during the voyage. Three Island Harbour proved very unsuited for the erection of a permanent station, and eventually the observatory was set up in Observatory Bay close to the English *Venus* Expedition's station. Considerable difficulty was experienced in unloading the ship, first on account of the stormy weather, and second because of the uselessness of the Chinese crew. Beri-beri broke out, two deaths occurred, and even the healthy members of the crew were found to be helpless and unenergetic, the climate being apparently quite unsuited to them. The difficulties culminated in a mutiny, and much of the work had to be done by the scientific members of the expedition. The results would have been much more serious had it not been for the quite unexpected delay in the arrival of the *Gauss* at Kerguelen. On the 20th of December, the date on which Dr. Enzensperger's despatch was sent off, the dwelling-house of the station was completed, the Variation house half finished, the Absolute house not begun, the stores for the *Gauss* landed. Unfortunately, the two chronometers for the station, as well as the theodolite and other instruments, were not on board the *Tanglin*, so that the magnetic observations could not be begun.—*Petermann's Mitteilungen*, 48, 1902.

Expedition to Magnetic North Pole.—Captain Roald Amundsen, late first officer of the *Belgica*, has sent us a copy of a paper read by him before the Norwegian

Geographical Society in November last, on an expedition which he proposes to undertake to the Magnetic North Pole. He has purchased the small whaler *Gjöa*, and has undertaken in her a trial trip to the Arctic Ocean. He proposes to start finally in the spring of 1903 in this small sloop with a party of six. The vessel at present has no engines, but is to be fitted with a small petroleum engine, a small amount of coal being taken for use in the galley. After visiting one of the Danish colonies on the west coast of Greenland for the sake of picking up Esquimaux dogs, the course will be continued by Lancaster Sound and Prince Regent Inlet to Bellot Strait. If the ice permit, the expedition will go through the Strait and pass along the west coast of Boothia, leaving a depot at the spot where Ross found the Magnetic Pole in 1831, and then seek for a winter haven either in Matty Island or in King William Land. The winter of 1903 will be employed in taking magnetic and other observations, and in the spring Captain Amundsen hopes to set off with three men and two sledges for the spot where Ross found the Magnetic Pole, making observations all the way. Round this point an extensive series of observations will be carried out, and as autumn approaches one of the sledges with two men will be sent back to the ship, while the leader with one companion will spend the winter of 1904-5 in a snow hut as near as possible to the Magnetic Pole, for the purpose of making regular magnetic observations. In the spring of 1905 the work of the previous summer will be checked, and then Captain Amundsen and his companion will return to the vessel, and if the ice permit, the journey will be continued westward, and the return made by the North-West Passage.

GENERAL.

Use of Ordnance Maps in Teaching.—Sir Archibald Geikie in No. 2 of *The Geographical Teacher*—a new addition to the list of geographical periodicals which we are glad to welcome—has an article in the use of ordnance maps in teaching to which the attention of all those interested in educational matters should be drawn. All schools, whether in town or country, should, Sir Archibald considers, be supplied with an ordnance map of the district on the largest scale available, the school being as nearly as possible in the centre of the map, and the whole mounted as a wall-diagram. First lessons in geography should be given on such a map, and small-scale maps should be tabooed until the pupils have mastered the relation of the large-scale maps to their surroundings. After this has been done with the parish or town maps of the locality, the pupil should be led gradually through the county maps to the appreciation of a general map of the kingdom. In detailed teaching the contoured and hill-shaded maps should be used in conjunction with geological maps to give an idea of the topography of the district and the causes of the surface features. Sir Archibald further points out that the ordnance maps are so cheap that they form an admirable basis on which the teacher may construct a whole series of excellent diagrams to illustrate special aspects of the Physical Geography of the country, with only a small initial outlay.

West Indian Agriculture. The Fourth Conference of the West Indian Department of Agriculture held in January of the present year shows that much useful work is being done. The sugar industry is receiving a large amount of attention, experimental stations having been established for the study of seedlings, while the insect and fungoid diseases are being fully worked out. The diseases of cacao are also receiving attention, and attempts are being made to establish a trade with London in sweet potatoes, to grow Irish potatoes for the same market, and to

develop the onion industry in Antigua, Montserrat, and Dominica. Further, the Central American rubber (*Castilloa elastica*) has been planted in Trinidad and Tobago, and experiments are being made on the best methods of converting lime juice into citrate of lime. Stock-raising of all kinds is also receiving the attention of the Agricultural Department, who are endeavouring to improve native breeds by the introduction of prize animals. A bee-expert has also been appointed to advise in regard to bee-keeping. The direct fruit trade between Jamaica and Great Britain has proved a great success, and is capable of much greater extension. The department, apart from its directly practical work, has interested itself greatly in educational matters, in delivering lectures to planters and school-teachers, and establishing agricultural schools.—*Nature*, February 6th.

Dr. Sven Hedin while at Lahore communicated to the press some notes on his prolonged travels in Asia. He reached Andijan in 1899 by the Transcaspian Railway, thence travelled on horseback to Kashgar, and by boat down the river Tarim to Lob Nor. From here he took excursions of varying length through the Gobi desert, and over the Thian Shan mountains, much of the ground covered not having been previously explored. He discovered a series of ruined cities of Chinese and Mongolian origin, about 800 years old, containing some remarkable sculptures and manuscripts ; this last discovery Dr. Hedin regards as of great importance.—*Times.*

Oxford School of Geography.—We have received a syllabus of the Long Vacation Course in Geography which the University of Oxford propose to hold from July 29 to August 19. Both men and women are admissible to the course, which includes lectures, demonstrations, and practical classes, while one day per week is to be devoted to surveying and mapping in the field. Intending students should apply to the Curator, School of Geography, Old Ashmolean Building, Broad Street Oxford. We have also received the report of the School of Geography for the year 1901.

Royal Geographical Society's Awards.—The two Royal medals of the Royal Geographical Society have been awarded to Sir F. D. Lugard for his African explorations and surveys, and to Major Molesworth Sykes for his journeys in Persia, extending over nine years, and his valuable studies of the geography of the country. The other awards of the society have been made as follows :—The Murchison grant to Mr. J. Stanley Gardiner for his researches in Funafuti Island in the Pacific, and the Maldive Islands in the Indian Ocean ; the Gill memorial to Mr. G. G. Chisholm for the services he has rendered during twenty-five years to geographical education by text-books of various kinds, atlases, and lectures, all of a high standard of value, as well as for his geographical investigations, among other subjects into cataracts and waterfalls, and on the sites of towns ; the Back grant to Lieutenant Amdrup of the Danish navy for his two voyages of exploration to the east coast of Greenland, during which he surveyed and mapped in detail much of the coast hitherto unknown or imperfectly mapped ; the Peek award to Mr. J. P. Thomson, founder of the Queensland branch of the Australian Geographical Society, who, by his writings and in other ways, has done much to promote the interests of geography in Queensland.

Professor Herdman reports that his investigation of the pearl fisheries of the Gulf of Manaar is being greatly facilitated by the assistance which he has been receiving in Ceylon. A steamer, the *Lady Havelock*, of three hundred tons, has been chartered, and work was begun at the end of January.—*Nature.*

Mr. R. Hay Anderson, a corresponding member of the Society, has sent to the library a fine collection of photographs illustrating scenes in Mexico; those representing buildings are of special beauty and interest. The photographs were taken by Mr. H. M. Stanley of Mexico city.

COMMERCIAL GEOGRAPHY.

Ostrich Farming in Western Africa.—Capitaine Frottiée has drawn up a report on the result of his two years' experimenting with ostriches at Goumbou. He believes that properly managed farms would yield large profits, provided an efficient European superintendent could be obtained. This, however, presents considerable difficulties, for not only are special qualities required, but the superintendent would have to be changed at the end of two or three years. The ostriches apparently thrive without a great amount of attention, especially in large enclosures, but they are singularly liable to panic if in any way alarmed or disturbed. In the wild rushes which ensue upon an alarm they frequently break or injure their legs against obstacles, and then invariably die. Apart from the plumes, which can be removed each year, the females lay forty to eighty eggs per annum, and though many of these are under ordinary circumstances lost or wasted, the author believes that with a proper incubator artificial hatching would yield good results. The cost per head in the experimental stations was 100 francs per annum, but on a larger scale this sum might probably be much reduced. The paper contains numerous practical hints as to the details of the farms, and the author looks forward to a time when the French in West Africa will dispute with the Cape the monopoly of the trade in ostrich plumes.—*Revue Coloniale*, 1901.

Development of Tanganyika Region.—In connection with the article in the *Magazine* of last July on Railway Schemes in Africa, and the illustrative map published in October, it is of interest to note a *Times* article on the trade of the Tanganyika region published recently. Hitherto the trade of the region has largely been in British hands, the route being chiefly that by the Zambesi, the Shiré river, and the British Central African Protectorate to Lake Nyasa. The great disadvantage of this route is the series of rapids on the Shiré river, which constitute a break in water transport, and necessitate the use of porters through the Nyasa Highlands. Recently the British Foreign Office has concluded an agreement with Mr. Sharrer's company for the construction of a light railway which will connect the navigable parts of the Upper and Lower Shiré, and so obviate this difficulty. Even this will not, however, remove all the difficulties of communication with Tanganyika by this route, for there remains a stretch of country between Nyasa and Tanganyika only partially available for wheeled traffic. On the map published with our October number, this region is crossed by the Stevenson Road, but it appears that only a small part of this road has any real existence. The British South Africa Company has constructed a broad wagon road from the border of the British Central African Protectorate to the south end of Lake Tanganyika, but this connects with Lake Nyasa by a road impassable to vehicles. This section of the road ascends nearly 3000 feet in 30 miles, and it would require £5000 to £7000 to fit it for wagon traffic, a sum which it appears the Protectorate Government is not able to disburse for the purpose. Nevertheless, as the Germans are fully alive to the necessity for the development of the rival routes which pass through their own territories, it would seem that it is highly desirable that this sum should be spent in fitting the road for wagon traffic. At present it costs about £55 per ton to deliver merchandise at Ujiji in

German territory on Lake Tanganyika by the British route starting from Chinde at the mouth of the Zambesi.

The rival routes to Lake Tanganyika are through German East Africa, and through the Congo Free State. The Germans have spent considerable sums on roads, and those of German East Africa are the best in Central Africa. Starting from Bagamoyo and Dar-es-Salaam, a road runs westward to Tabora, and then northwards to Muanza on the southern shore of Victoria Nyanza. From Tabora there are branch roads to Ujiji and Bismarckburg on Lake Tanganyika. Another road leads from Kilwa on the coast to Withaven on Lake Nyasa. Thence there is steamer communication on the lake with Mwaya, from which place a road is being constructed to connect up with the British road to Tanganyika. By the first of these two routes to Tanganyika the cost per ton from Bagamoyo to Ujiji is £106, while by the Kilwa-Withaven route the cost to Bismarckburg is £52 to £60 per ton. By the British route goods can be delivered in Bismarckburg at £49 per ton. All the goods for German stations on Tanganyika are now brought by one of the two German routes, and though the British still hold some of the German carrying trade to German Nyasaland, the German administration is desirous of developing the Kilwa-Withaven route as rapidly as possible, and using it exclusively.

In regard to future developments, it is probable that the Uganda railway will somewhat modify the trade conditions of the interior. The Germans again are desirous of constructing a network of railways in German East Africa, while the projected Congo Free State railways will also modify existing conditions.

Bolivia and its New Territories.—The Hon. Florian Zambrano, High Commissioner and Financial Agent to the Bolivian Government, has communicated to the United States Consul at Para a report on the recent settlement of the boundary dispute between Brazil and Bolivia. As a result of the settlement a large tract of land has been transferred to Bolivia, and the Government is prepared to make large concessions to capitalists and colonists, with a view to opening up the new territory. In the high region there are rich mineral deposits, the middle region produces Indian corn, potatoes, and grapes, the plains coffee, cocoa, and the sugar cane, as well as rubber and vanilla. The rubber plantations are apparently valuable, the land seceded including the rivers Acre, Yacu, Upper Purus, and Upper Jurua, with their respective affluents. Of these the rubber export of the Acre amounts to 3500 tons per annum, and of the other rivers to 5000 tons per annum. Many of the present rubber planters are stated to be willing to sell their plantations. The Government of Bolivia is desirous of establishing and subsidising a line of foreign steamers to ply between Para and European ports.—*Times.*

Production of Cocoa in Africa.—According to a *Times* correspondent, the cultivation of cocoa is being very successfully pushed throughout the continent of Africa. This year the German colony of the Cameroons hopes to export 3000 bags, and by 1906 they expect to increase this to 10,000 bags. A shipment of 210 plants has taken place from here to Lomba in British Central Africa, where the scientific department hopes to successfully grow them, so that they may serve as a nucleus for future plantations. In Lagos also it is believed that cocoa may be profitably grown. There seems some reason to believe that Africa in this respect will ultimately be a dangerous rival to the West Indies.

Coal Beds in Belgium. At its meeting on March 17, the Liége Geological Society discussed the recent discoveries of coal in the district known as La

Campine, situated in the province of Antwerp. Experts are of opinion that an extensive coalfield exists in this region which connects the coal of Yorkshire with the Westphalian deposits. High hopes are entertained of the economic value of the new coalfield and the effect which the discovery is likely to have on the development of Belgium.

NEW BOOKS.

EUROPE.

Die Vegetationsverhältnisse der illyrischen Länder. By Dr. Günther Beck v. Mannagetta, Prag. Leipzig: W. Engelmann, 1901. 6 plates, 18 figures in text, and 2 maps. Pp. xv+534.

This is the fourth of the monographs on the Vegetation of the Earth edited by Professors Engler and Drude.[1] The author of the present work is Professor of Botany, etc., at Prag, and since 1886 he has published many papers on the vegetation of this part of Europe. The area is the north-west quarter of the Balkan Peninsula, extending along the Adriatic from the Gulf of Fiume (about 45° N.) to Lake Scutari (42° N.), and includes the Quarnero Islands, South Croatia, Dalmatia, Bosnia, Herzgovina, Montenegro, North Albania, and Servia. The vegetation is divided into three chief zones, the Mediterranean, the Oak-region, and the Alpine, corresponding to the coast-lands, the plains and hills, and the mountains, respectively. For each zone a summary of climatic and geological conditions is given, then the vegetation is subjected to a careful analysis to determine the chief subdivisions; these are described in detail and characteristic plant associations given. The cultivated land with its plants of economic value is also dealt with in the three zones. The latter part of the work deals with the floristic aspect of the area, its present condition, its relationship to neighbouring countries, and its development since the Tertiary period. A long bibliography of papers, and a historical account of the botanical exploration of the area constitute the introductory chapter. The almost total absence of papers in English is significant, and indicates how useful the monograph will be to those interested in plant-life in this somewhat unknown part of Europe. The plates from original drawings by the author, and the figures reproduced from photographs, show the vegetation in its natural surroundings; they are so useful as aids in conception that one regrets there are not more of them. One great defect of the work is want of maps. The importance of climate and geological features is recognised throughout the work as influencing vegetation, yet one must picture for oneself what these are by reading about fifty pages scattered at intervals. The only two maps given represent subdivisions of the vegetation: one is on a scale of one inch to 23 miles, the other one inch to 46 miles; both, we consider, are too small to do justice to the accurate investigations which the author has carried out. More might have been expected in a work issued under this editorship, especially as Flahault, in dealing with the vegetation of a somewhat similar area on the French Mediterranean coast, has published maps on the scale of one inch to two and a half miles, with excellent results.

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[1] II. Pax, on Carpathians—see *Scottish Geographical Magazine*, xiv., August 1898, p. 440. III. Radde, on Caucasus—*idem*, xv., June 1899, p. 334.

Finland As It Is. By HARRY DE WINDT, F.R.G.S. London: John Murray, 1901. Pp. 316. *Price* 9*s.*

So celebrated a *raconteur* as Mr. de Windt was sure to give an entertaining description of his tour through Finland in August 1900. According to him "the great charm of Finland lies in the fact that one may explore its wildest districts in comfort, if not in absolute luxury." From St. Petersburg he proceeded *viâ* Viborg to Helsingfors, the capital of Finland, and, in his opinion, "the most pleasurable city in Northern Europe. Stockholm is perhaps finer, but lacks the lovely surroundings." He then visited "the Northern Gibraltar," Sveaborg (which is not shown on the indifferent map appended) and found it to be garrisoned by Russians, not Finns. Throughout his interesting and instructive book, Russians and mosquitoes hover as the disturbing elements of the tour. He mentions that, as a rule, only Finnish or Swedish is spoken in Finland, and that Finnish is more complicated and difficult to acquire than Russian. He recommends travellers to obtain the *Atlas de Finlande*, published by F. Tilgmann at Helsingfors in 1899, which he considers one of the most valuable geographical works he ever met with.

From Helsingfors he proceeded by railway to Tammerfors "the Manchester of Finland," but one of the prettiest of towns, as water, not coal, is employed. Its chief export is paper, extracted from the pulp of the pine and poplar: most of the product is sent to Britain. Cloth, cotton, flax, and iron are also important industries, and, whilst labour is far cheaper than in England, strikes are unknown. Two-thirds of the butter sold in England as "Danish" come from Finland, which annually exports £1,000,000 worth of butter. The trade between Finland and Britain increased in value sixty-one per cent. between 1894 and 1897. He reached Sweden *viâ* Vasa or Nikolaistad, "the prettiest town in Finland," Uleaborg, the centre of the timber and tar industry, and Tornea. He mentions that the roads and inns being good, Finland is well adapted for cycling, and that bicycles already abound there. The volume, which is well illustrated, ought to induce many tourists to visit Finland.

Springtime in the Basque Mountains. By A. L. LIBERTY. London: Grant Richards, 1901. Pp. 299. *Price* 12*s.*

If in Pierre Loti's *Ramuntcho* we get the romance and poetry of the Basque country, Mr. Liberty gives us from his diary, written in the spring of 1897, the practical details of travelling amid the little-known Basque mountains. His book is beautifully illustrated by Emma L. Liberty and others, and ought to furnish a most attractive and useful handbook to a country easy of access and yet rarely visited by travellers.

ASIA.

An Artist's Walks in Bible Lands. By HENRY A. HARPER, author of *Walks in Palestine*, etc.; with a Photogravure Frontispiece and 55 other Illustrations from Drawings by the Author. London: The Religious Tract Society. Pp. 256. *Price* 6*s. net.*

Numberless as are the books on the Holy Land, there is a distinct place for this posthumous one of Mr. H. A. Harper's. It tells its story by brush and pen. Mr. Harper often visited the land of the Bible, and spent months there at a time. He was familiar with the language of the people, and read with more than usual accuracy their characteristics, as well as those of their country and their cities. He drank of the spirit of the land, and to these pages he has transferred his impres-

sions. You feel in every page you read, and in every picture you study, this is no traveller speeding over the land, but one who pauses to reflect, spends days and nights watching the people and the country in varying moods and aspects. Hence we have a charming book, which those who have visited, and those who have not visited, the "sacred acres" will like to possess.

Mr. Harper truly says, "The Holy Land has never been painted as it deserves to be," and he declares, "Without hesitation the photographs are a libel on the landscape," because "so much of the beauty there depends on its unique colour—so pale, so pure—and on its intense light." His own pictures bear this out. They give a different impression of the country from what photographs do, and make you feel that here you have a more realistic representation of its ruins and rocks, its plains and mountains.

Only once does the author misquote his reference, when he credits Moses with saying what Isaiah said, "The thoughts of God are not your thoughts, nor His ways your ways."

The geographical value of the book lies in the excellent illustrations. The letterpress is admirable, and the general get-up is perfect.

A Geography of Asia, including the East Indies. By Lionel W. Lyde, M.A., F.R.G.S. London: Adam and Charles Black, 1900. *Price* 1*s.* 6*d.*

Black's School Geographies are already well known to and appreciated by the public; so the one now before us, dealing with the geography of Asia, is sure of a welcome. It is difficult, however, to understand the class of student for whom it is intended. The whole subject is condensed into a hundred octavo pages, and yet among the problems set at the end we have questions on which a good many octavo pages might be written; *e.g.* "compare the position of the United Kingdom with that of Japan, and show what difference it would make to both if the earth rotated from east to west; and compare the political and economic value of the various European 'spheres of influence' in Eastern Asia." Surely the ordinary schoolboy cannot be expected to answer such problems as these.

With the Tibetans in Tent and Temple: Narrative of Four Years' Residence on the Tibetan Border, and of a Journey into the Far Interior. By Susie Carson Rijnhart, M.D. Oliphant, Anderson, and Ferrier, Edinburgh and London, 1901. Pp. 406. *Price* 6*s.*

The unknown has its fascinations for men; and Tibet, the great sealed land on the roof of the world, draws, as with a magnet, the traveller and the missionary to itself. Prjevalski, Bonvalot, Rockhill, and Landor have all tried to pierce the country, and have had a thrilling tale to tell. Dr. Susie Rijnhart, in her modest story, has a no less thrilling record of heroism and endurance. Her devoted husband—Rev. Petrus Rijnhart—and herself aimed at opening up the country to the blessings that have redeemed and ennobled the West. In 1895 they settled at Lusar across the Tibetan border, passed through the Mohammedan rebellion, and by their devotion and skill among the sick and wounded won their way to the hearts of the people. Later they removed to Tankar, farther inland, where they welcomed Captain Wellby and Dr. Sven Hedin as they battled with the closing difficulties of their memorable journeys. After three years in these regions, in course of which they made a journey among the Tanguts in the Koh-o-nor, they resolved to approach the great Tibetan capital, Lhasa, and hoped by living on its outskirts to pursue their calling, and some day effect an entrance. The journey thither, over lone mountain passes infested with robbers, has tested the mettle of

experienced travellers, and to essay it with a child of ten months seemed a needless tempting of Providence. All went well for a space, until the unpopulated rocky regions beyond the Ts'aidam were reached, when their sorrows began. Their child died suddenly, and was buried at a lone spot at the foot of the Dang Laz mountains. Official spies followed them, and at last, when within 150 miles of the capital, peremptory orders were given to return. Selecting a different route, they started; but guides betrayed them, and left them when their perils abounded. Alone, Mr. Rijnhart went to a native camping-ground he espied to get assistance, and disappeared for ever. What fate befell him was never known. Solitarily the brave lady, facing almost hourly peril, pursued her way, and only after two months' exciting experiences did she find herself in the arms of friends in the China Inland Mission House at Ta-chien-lu in Sze-chuan.

Mrs. Rijnhart has an observant eye and a vivid pen. Valuable information does she give as to the character of the country—fertile and rocky, riven with earthquake, and racked by storms. Still more valuable is what she relates regarding the customs, beliefs, social conditions, and language of the Tibetans. Her long residence gives her advantage over other travellers in this respect. Morality, she declares, is at a low ebb; ignorance is profound, and the habits of the people are filthy in the extreme, dirt and food being mixed up without compunction. Mr. Rijnhart was a thorough Chinese scholar, and Mrs. Rijnhart found her medical skill of great service, and the two won the confidence of many of the Lamas. In a while a residence was assigned them within the great Lamasery at Kumbum, "one of the holiest spots on Asiatic soil." A frequent host and guest was Mina Fuyeh, the "abbot" of Kumbum, a "living Buddha." She says the Lamas know nothing about Mahatmas, and are far from having the occult and wonderful knowledge Theosophists at home credit them with. "They are mere children in knowledge, swayed by the emotions that play on the very surface of being. During our four years' sojourn among Tibetans of various tribes and districts, we did not meet a single Lama who was conversant with even the simple facts of nature." Indeed, this class that so dominates the land is of the earth, earthy, and many of them are drunken and dissolute.

The book is furnished with rather a poor map, showing the journey undertaken in 1898, but it contains valuable geographical notes, carefully taken by Mr. Rijnhart, and is a record of noble heroism rare even in the stirring annals of missionary enterprise.

Baghdad during the Abbasid Caliphate. By S. Le Strange. Oxford: The Clarendon Press, 1900. *Price* 16*s.*

The author of this extremely erudite and ingenious work tells us in the preface that the idea of constructing the topography of mediæval Baghdad was suggested to him by the late Sir Henry Rawlinson in 1883; but the task proved much more formidable than he anticipated, owing to the mass of information which he found to be available for the elucidation of his subject. Happily he was able to accomplish his task, and we have now before us an excellent topographical guide to Baghdad during the five centuries of the Abbasid Caliphate, with good maps and plans and much historical information. The interest is, of course, more archæological and antiquarian than geographical, but the results are very interesting, and could not have been achieved without much patient research, careful comparison of authorities, and skilful weighing of probabilities. Modern Baghdad is contained within an area of not much more than one square mile, whereas, in the days of its glory, mediæval Baghdad occupied an area of about twenty-five

square miles. It is this larger area which Mr. Le Strange has so laboriously and skilfully mapped out for us, commencing his investigation with the foundation of the city on the western bank of the Tigris in 762 A.D. by the Caliph Mansûr, and concluding with its demolition at the hands of the Mongol Hûlágû, the grandson of the famous Changiz Khan, in 1258 A.D. The book is a most valuable addition to the literature dealing with the Abbasid Caliphate.

John Chinaman. By E. H. Parker. London: John Murray, Albemarle Street, 1901. *Price* 8*s.*

In former issues of this magazine we recommended to our readers important works on China and the Chinese by Michie and Hosie. We have now before us an amusing and interesting volume entitled *John Chinaman*, by Mr. Parker of the Chinese Consular Service, whose experience extends over a period of some thirty years. He has served also in an unusually large number of stations; and this record of his experiences shows him to be a man of kindly heart, large sympathy, keen intelligence, and prompt decision. He often found himself in tight places where his own safety, or more commonly that of others, depended on his deliberately exceeding his powers, and he had to trust that his illegal action would be supported by his superiors in authority. It is to the credit of the Consular and Foreign Offices that they never failed him. His style is bright and vivacious, and now and then humorous, and his sketches of the statesmen and soldiers whom he has come across lifelike and piquant. Let us hope that Mr. Parker, instead of an *olla podrida* of sketches, however pleasing, will give to the public the fruit of a so long and exceptional experience in a more weighty and ambitious form. The illustrations of this book are excellent.

AFRICA.

The Strange Adventures of Andrew Battell of Leigh. Edited by E. E. Ravenstein. London: Printed for the Hakluyt Society, 1901. Pp. viii + 209.

The volume now before us is the sixth of the second series of the publications of the Hakluyt Society, and deals with the province of Angola on the west coast of Africa. It contains the story which Andrew Battell of Leigh in Essex narrated to Samuel Purchas about the year 1612 A.D. and published in 1613 A.D. The unfortunate Battell had sailed from Plymouth in 1589 A.D. for the River Plate, but was captured by the "Portugals" and carried off to Angola, where with strange adventures and experiences he remained till 1610 A.D., when he succeeded in making his escape. The interest of his narrative lies in the two facts, that it is the first we have from any one who visited the interior of Angola, and that its veracity has stood the test of time and other explorations. We may contrast with it the narrative which follows, viz., that of his companion in misfortune, Anthony Knivet. It, however, is so full of incredible statements that it is useless, except as a curiosity. The editor, Mr. Ravenstein, has contributed two interesting chapters, setting forth the history of Kongo and Angola to the end of the seventeenth century, with lists of the kings and governors, and he has also prepared two excellent maps, with the aid of which the reader can follow the itinerary of honest Battell, and the labyrinth of tribal wars which, for the most part, make up the history of the time. Suitable and judicious notice is taken of the part played by Jesuits and other missionaries in the tangled web of the affairs of the contending tribes and chiefs. We can commend this volume to our readers with confidence as well up to the great reputation of the Hakluyt publications.

The Land of the Vine. By A. J. Drexel Biddle, F.R.G.S., F.E.S.A., F.R.M.S. London: Funchal, Drexel Biddle, Publisher. Philadelphia and San Francisco. 1901.

If any of our readers contemplate a sojourn in Madeira in pursuit either of health or of amusement, they could not do better than furnish themselves with a copy of this excellent *vade-mecum* compiled by Mr. Drexel Biddle. It contains almost everything that is known about these famous islands, and gives minute information how to get there, how to live when you are there, what to see, and how to go about seeing it, and so on. There are also chapters of interest to the student of history, of manners, of commerce, etc. We must add that both volumes are profusely and excellently illustrated; and that while they convey all the information and much more than the information of a Baedeker, they are written in a style very different from that of the ordinary guide-book.

The Sherbro and its Hinterland. By T. J. Alldridge, F.R.G.S. London: Macmillan and Co., Limited. New York: The Macmillan Company, 1901. *Price* 15*s*.

The extent and resources of the British Empire have of late been the subject of much discussion and controversy, but we doubt if one in ten of those who imagine themselves to be fairly well posted up in the various colonies and dependencies of Great Britain can tell where Sherbro and its wealthy and interesting Hinterland are. And yet, within the last four years, it was the scene of a formidable and sanguinary insurrection, in which not a few British lives were lost. Sherbro and its Hinterland are under the jurisdiction of Sierra Leone, one of the most backward, although it is the oldest, of our West African colonies. It is to be hoped that this able and interesting work of Mr. Alldridge will go far to bring the colony and its resources and potentialities into notice, for they certainly deserve the attention of a commercial world which is always crying out for new markets and new lands. At present, according to Mr. Alldridge, the only trade of any importance in Sherbro is that of palm oil; whereas, in addition to this, the colony could supply a practically unlimited amount of rubber, rice, coffee, bananas, pine-apples, cocoa-nuts, and mangoes. Besides this, there is an unlimited possibility for cotton, which has been already pronounced by the Manchester Chamber of Commerce to be "of good quality, and worth about 6d. per lb. in Liverpool . . . and so acceptable to Lancashire spinners who have used it, that they would gladly welcome a very much larger supply than is now available." But a perusal of Mr. Alldridge's book leaves no doubt as to the real difficulties in the development of the country. They are the climate, the people, and the want of the means of communication. The climate of the West Coast of Africa is notorious, and even Mr. Alldridge is fain to confess: "I have no good word to speak of the climate upon the coast, and the death-rate amongst the Europeans during the past two years will corroborate this assertion. I believe the climate to be as bad to-day as it has ever been." But he adds his belief that "malaria and mangroves go together. When you are out of the influence of the mangroves you are beyond the region of malaria." As to the climate of the inland region, it is at least much better than that of the coast, but apparently huge tracts of the Hinterland are practically a swamp. Mr. Alldridge at one place says, "In the six days' march from Waria to Kamaror we had passed through no less than one hundred and seventy-one swamps, running streams, and quagmires," and a few pages further on he tells us, "On this day we had passed through one swamp, thirteen quagmires, crossed twenty-seven running streams, and three big rivers." As to the people, they are still but little, if

at all, better than savages, sunk in degrading superstitions, worshippers of fetich. Only a few years ago, many of them were slave-drivers, and some of them cannibals. The rule, or if the term Protectorate is preferred, the Protectorate of Great Britain is beginning to have its usual beneficent effects, and, according to Mr. Alldridge, slave raids and cannibalism have disappeared; and the people, from the chiefs to the lowest class, fully appreciate the advantages of British rule, and are very grateful for its blessings—an opinion, however, which is hardly corroborated by the Mendi insurrection of 1898. On the other hand, it is obvious that the civilisation of such tribes can only be the work of many years, and, indeed, generations. With regard to means of communication, it may be said that, with the exception of some waterways, they are non-existent, and the only means of conveying produce from the interior is by porterage.

Mr. Alldridge has probed, so far as it was possible to do so, the obscure, and, in many respects, repulsive subject of native secret societies, which, up to the commencement of the Protectorate, found a congenial soil in the Hinterland, and which still are a grave hindrance to the advance of civilisation and good government. The last half of his book is devoted to a description of tours he made either by himself or with the Governors of Sierra Leone in the interior, from which it is abundantly clear that Mr. Alldridge has the invaluable faculty of acquiring the goodwill and confidence of the natives, and the calm courage, fertility of resource, and imperturbable good humour which are indispensable for success in dealing with such people.

The book is equipped with many excellent illustrations and a couple of good maps. When it comes out in a second edition, it would be wise to adopt the same spelling of place-names for both the letterpress and the maps.

AMERICA.

The Thirteen Colonies. By Helen Ainslie Smith. New York and London: E. P. Putnam's Sons, 1901. *Price* 12*s.*

In these two volumes Miss Ainslie Smith has endeavoured to present to the public a history of the original thirteen colonies of the United States up to the year of the famous Declaration of Independence, in a form different from that of an ordinary history. She claims that "this is the first single work in which is presented separately the record of each of the thirteen colonies, from its first settlement to the Declaration of Independence. The attempt has been made not only to depict each plantation upon its own geographical background, but as a distinct entity, to show the decisive events of its object and growth. I have also endeavoured to present the characteristics of its people, and, so far as space allows, to give glimpses of the humour, and even of the frailties of their daily lives, together with a study of their statecraft, their business enterprise, and, above all, of their religion, which was so large a factor in the founding and in the maintenance of nearly all of the colonies." A perusal of the work shows that Miss Ainslie Smith has very successfully achieved her object; and although the histories of the colonies necessarily intertwine and overlap each other here and there, there is very little of repetition in what is presented to the reader. Her style is incisive, easy, and graceful; and although she does not spare the insensate folly and injustice of the British Government which led to the loss of America from the empire, yet she is discriminating and moderate in her language, so that readers on this side of the Atlantic find no cause of offence in her observations. The work is embellished with many well-executed illustrations of interesting antique paintings, engravings, photographs, etc., which are not usually accessible to British readers.

BOOKS RECEIVED.

We have received the following new books which will be reviewed in due course :—

The Scenery of England and the Causes to which it is due. By the Right Hon. Lord Avebury. London : Macmillan and Co., 1902. Royal 8vo. Pp. xxvi + 534. *Price* 15*s.*

The British Empire Series. Vol. v. *General.* By various Authors. London: Kegan Paul, Trench, Trübner and Co., 1902. 8vo. Pp. vii + 681. *Price* 6*s.*

Catalogue of the African Plants collected by Dr. Friedrich Welwitsch. By W. P. Hiern. London : Printed by order of the Trustees of the British Museum. Four parts, 1898-1901.

Grammatical Fundamentals of the Innuit Language as spoken by the Eskimo of the Western Coast of Alaska. By the Rev. Francis Barnum, S.J. Boston, U.S.A., and London : Ginn and Co., 1901. Pp. xxv + 384. *Price* £1.

Denmark : Past and Present. By Margaret Thomas. London : Treherne and Co., 1902. Pp. 302. Crown 8vo. *Price* 6*s.*

History of the Conquest of Peru. By W. H. Prescott : edited by John Foster Kirk. Bohn's Libraries. London : Bell and Sons. Two vols. Pp. xxxiv + 51 and xx + 530. Small post 8vo. *Price* 3*s.* 6*d.*

Afoot through the Kashmir Valleys. By Marion Doughty. London : Sands and Co., 1902. Pp. xxxii + 276. Demy 8vo. *Price* 7*s.* 6*d.*

History of Scotland. Vol. ii. By P. Hume Brown. Cambridge Historical Series. Cambridge University Press, 1902. Pp. xiv + 464. Crown 8vo. *Price* 6*s.*

The Portfolio. No. 42. *Mediæval London.* London : Seeley and Co., 1901. Pp. 81. Super-royal 8vo. *Price* 5*s.*

A Ride in Morocco. By Francis Macnab. London : Arnold, 1902. Pp. x + 367. Demy 8vo. *Price* 15*s.*

Japan, our New Ally. By Alfred Stead. With an Introduction by the Marquis Ito. London : T. Fisher Unwin, 1902. Pp. 250. Crown 8vo. *Price* 5*s.*

The Student's Handbook of Stratigraphical Geology. By A. J. Jukes-Browne. London : Stanford, 1902. Pp. vii + 589. Large crown 8vo. *Price* 12*s.*

Central and South America with the West Indies. Descriptive Geography from Original Sources. By F. D. and A. J. Herbertson. London : A. and C. Black, 1902. Pp. vi + 239. Small crown 8vo. *Price* 2*s.*

The Statesman's Year-book, 1902. Edited by J. Scott Keltie. London : Macmillan and Co., 1902. Crown 8vo. *Price* 10*s.* 6*d.*

Eine Australien und Südseefahrt. Von Albert Daiber. Leipzig : Teubner, 1902. Pp. 320. Royal 8vo. *Price* 7 *marks.*

Auf Java und Sumatra. Von Dr. K. Giesenhagen. Leipzig : Teubner, 1902. Pp. x + 270. *Price* 9 *marks.*

Die Alpen im Eiszeitalter. Von Dr. Albrecht Penck und Dr. Eduard Brückner. Parts I. and II. Leipzig : Tauchnitz, 1902. *Price* 5 *marks each part.*

Report of Administration of the Madras Presidency during the year 1900-1. Madras : 1901. Pp. 181 + cxcix. *Price* 16*s.*

Sul Limitare dell' India. By Dott. Alfonso Lomonaco. Torino-Roma : Roux e Viarengo, 1902. Pp. 236.

Publishers forwarding books for review will greatly oblige by marking the **price** *in clear figures, especially in the case of foreign books.*

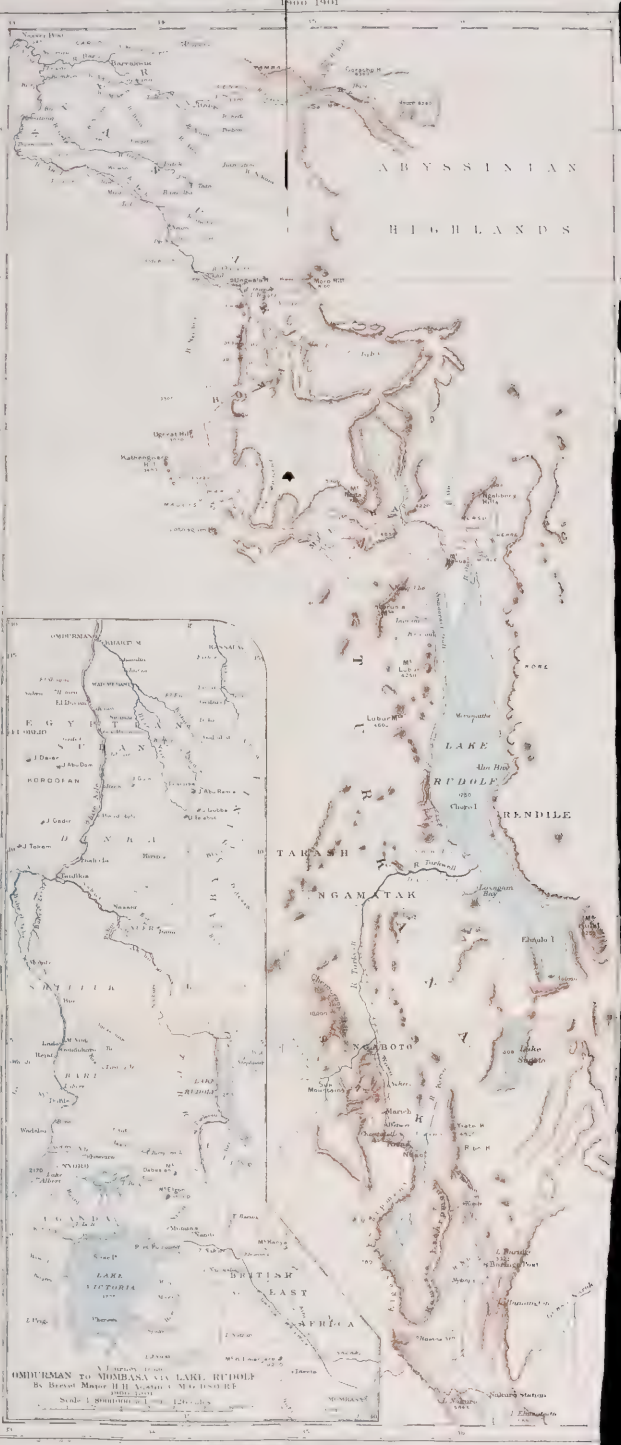
ROYAL SCOTTISH GEOGRAPHICAL SOCIETY

LAND JOURNEY FROM NASSER TO THE UGANDA RAILWAY AT LAKE NAKURU

By

BREVET MAJOR H. H. AUSTIN, C.M.G., D.S.O.

1900-1901



THE SCOTTISH GEOGRAPHICAL MAGAZINE.

THROUGH THE SUDAN TO MOMBASA *VIA* LAKE RUDOLF.[1]

By Major Austin, C.M.G., D.S.O., R.E.

(With Map.)

I propose in the following paper to give a brief account of an expedition I lately had the honour to command, which, starting from Cairo, worked its way through the Sudan, and reached the Indian Ocean at the port of Mombasa. I was accompanied by Major R. G. T. Bright of the Rifle Brigade from England, where, during the greater part of November 1900, we were busily engaged in fitting out the expedition, which it was anticipated would be absent for about a year. All the equipment was shipped off from London on the 22nd November in the P. and O. ss. *Caledonia*, and we, travelling overland a week later, joined her at Marseilles. Port Said was reached on the night of the 4th December; our stores were landed there, and so expeditiously passed through the Customs, that on the 7th we had all our belongings in Cairo. Here we were joined by Dr. J. Garner, and spent the next few days in obtaining the services of servants, cook, interpreters, etc., whilst our doctor, who had received very short notice to accompany the expedition, was busily employed in equipping himself for the long journey he was about to undertake. On the 15th December we left by rail for Assuan, some 500 odd miles south of Cairo, and here took over an escort of one native officer and twenty-two non-commissioned officers and men of the Xth Sudanese Battalion, who had been completely fitted out by their commanding officer, Hunter Bey. Owing to his excellent arrangements there was no delay, and on the evening of the 17th we were able to proceed up the Nile for the next 200 miles by steamer. The Sudan Military Railway then was boarded at Wadi Halfa, and we continued the journey, travers-

[1] A paper read before the Society on May 8th.

ing for the first 230 miles a barren, sandy desert, as the line cuts off a great bend of the Nile, which it meets again at Abu Hamed. We should have found ourselves on the Nile when we awoke on the morning of the 21st December, instead of which we were still at mile 127 from Halfa, as the engine had broken down about midnight. There were some four or five Egyptian Army officers proceeding on duty to Omdurman, and eventually permission was obtained to commandeer the engine belonging to another train, which happily arrived from Halfa shortly before 8 A.M., and we were able to continue on our way, reaching Khartoum station on the night of the 22nd. The distance from Cairo is roughly about 1350 miles; but we still had close on 2500 miles to travel before we were destined to reach Mombasa. On arrival at Omdurman, which, it is perhaps needless for me to say, is only a few miles distant from Khartoum, we learned from Colonel the Hon. M. G. Talbot, R.E., that he had already very nearly completed the purchase of the transport animals for the expedition, and also enlisted some ex-dervishes, known locally as Jehadia, to act as transport drivers. He had most kindly arranged all these details, as well as the equipping of these men, so we were only detained a few days at the Kalifa's old capital before commencing our long river journey of some 680 miles to Nasser Fort on the River Sobat. I must not enter into any lengthy account of this portion of the journey, for the Nile to Fashoda and beyond is so well known that I am not likely to be able to relate any facts of which you have no previous cognisance, and there is so much that remains for me to narrate that I should probably keep you here until a very late hour. I hope shortly, however, that a book will appear recounting in detail all our experiences, and any of you that may be interested in what I am going to tell you to-night, I trust will be still more so on perusing that volume.

Whilst proceeding leisurely up the Nile in the stern-wheel gunboat *Fateh*, which towed two double-decked barges and two sailing boats, on which were accommodated all our men, stores, rations, equipment, and transport animals, I should tell you something regarding the composition of the expedition. All told we numbered sixty-two souls; we had been obliged to return two men of the escort at Taufikia, before we turned off up the Sobat, as they were too ill to accompany us any further. There were our three selves—Major Bright, Dr. Garner, and myself—one native officer, one Arabic interpreter and one Amharic interpreter, 20 non-commissioned officers and men of the escort, 32 Jehadia, and four personal servants and cook. Our transport animals consisted of 15 camels, 12 mules, and 125 donkeys. We were taking three months' supply of food from Omdurman for the river journey and the land journey beyond, at the end of which time we expected to reach Murle on the river Omo, and there obtain fresh supplies, which we hoped were being sent to meet us at that point. Owing to the lateness of the season it was doubtful if we should be able to reach Nasser by steamer, as once the tropical rains of those regions cease the rivers run down very rapidly, and between January and May, or June, no river communication by steamer is possible between Nasser and the Nile. We were fortunately able, however, to reach Nasser on

the 11th January, and commenced disembarking the following day—some nine miles further up stream, on the left bank. We were accompanied to that point by the Mudir of Fashoda, Blewith Bey, in his steamer the *Abu Klea*. He returned to Taufikia on the 14th, and was immediately followed by our little flotilla, as all our animals, stores, etc., had been landed, and we at once commenced preparations for the land journey. We were now cut off from all communication with the outer world, of which we heard nothing further until we reached Lake Baringo on the 2nd August. How complete that isolation was you may perhaps be able to gather when I tell you that on that date we heard for the first time of the death of our gracious Queen Victoria. We three were perhaps the last white men in the whole world to hear of this sad intelligence—nearly seven months after it had occurred. During the 14th, 15th, and 16th January we were all hard at work getting the loads arranged in their saddles, apportioning those respectively for the camels, mules, and donkeys. I had calculated only on carrying two months' supplies of food for the men, and as we had nearly a fortnight's rations on hand, over and above that amount, we were compelled at first to travel slowly by double stages, until the surplus food had been consumed, when we could proceed direct, without having to send back for food left behind. During this period we practically went over old ground that I had surveyed the previous year—generally south along the Pibor to the junction with that river of the Akobo. The Royal Geographical Society's *Journal* for May 1901 contains an account of our experiences then, so it will be unnecessary for me to say much about that portion of our travels, except to describe generally the nature of the country traversed. Nasser port is in the heart of Nuer territory, this populous and warlike nation occupying a great extent of land along the Sobat and Pibor rivers, and constantly raiding and ill-treating their less formidable neighbours. They are a most uninteresting race, who view white men with considerable suspicion, as they have not yet got over their experiences of the Turks, which term they apply to all Europeans. Although in no way hostile, they are extremely indolent and shy, and prefer the room of a white man to his company, generally—a state of feeling that one can scarcely help heartily reciprocating, as the Nuers are about as depraved and low in the scale of humanity as any natives I have met during some five years' wanderings in Africa. The men are physically tall and well built, with long, wiry limbs; but one never sees an ounce of superfluous flesh on any of them, for they cultivate very little grain, and for six months in the year live almost entirely on a fish diet. During the dry season the receding waters of the rivers form numerous pools, in which hundreds of large fish of the Siluroid type are easily speared. The consequence is that the natives of the Sobat and Pibor regions have certain fixed settlements some distance inland, to which they retire during the rainy season, when the whole surrounding country is converted into swamp. During the dry season these are temporarily abandoned, and other villages are rapidly run up near regular fishing-places, where the natives dwell and carry out spearing operations between January and the beginning of May. As the men

smear themselves over with wood ashes, they are a peculiarly dirty-looking crowd, and, I need hardly add, are all stark naked. The older women are as filthy in appearance as the men, and merely content themselves with a fold of hide round the loins; but the unmarried women and maidens, though more cleanly, are quite satisfied with Eve's costume before the Fall.

We had not encountered much difficulty regarding swamp during our passage up the Pibor, as it was of course the dry season. The long, coarse grass also, which by the end of the rainy season attains a height of from twelve to fifteen feet, is generally immediately burnt by the natives when it has become sufficiently dry to ignite readily. In most parts this had been done, and we experienced few delays worth mentioning until we reached the junction of the Akobo and Pibor rivers. Here we were fortunate in alighting on a small colony of Anuaks, near neighbours of the Nuers, two of whom consented to act as guides to us during our further progress up the Akobo. For the first two days we proceeded almost due east along this river, which twists and turns to an amazing extent, and was then about twenty yards wide, and flowing very rapidly towards the Pibor. The banks along this portion were generally well wooded with thorn jungle, and several small families of Anuaks were met with, who availed themselves of small natural arbours, and existed in a precarious fashion on the frugal products of the woods. They were all evidently waiting until such time as they would be able to carry out fishing operations, when the river had receded sufficiently to enable the catfish to be readily speared. These natives were a very miserable race, and lacked the physique and prosperous air of their compatriots of the Baro or Upeno river, and all were quite naked, except perhaps the elderly matron of the family, who merely wore a small piece of dirty hide round the waist.

We now crossed to the left bank of the Akobo, and still continued during the earlier portion of our next march through thorn bush; but subsequently we entered treeless grass plains, and were soon confronted with formidable swamps which bordered the river banks. We were unable for four or five days to approach the stream at all, and much labour was entailed on all struggling through long, coarse grass, in our efforts to work along on dry ground round the margin of the swamps. As may be imagined, mosquitoes tormented us almost beyond human endurance at night-time, and even our transport animals were driven nearly frantic by the persecution of these myriads. After the molestation of dreadful night one welcomed dawn and the rising sun more than I can describe; for then, at all events, we should have some respite until the coming eve. Dining after sundown was always a pitiful performance, for great grass fires had to be lit to the windward of our table, for we far preferred being smothered in smoke as we ate, in spite of our eyes painfully smarting and streaming, to being maddeningly attacked by these hateful insects. At length, on the 15th February, we reached the Tedo district, at which point our guides wished us to cross the river to the right bank again. As we were separated from the stream by a broad belt of coarse grass and swampy overflow channels, nearly a mile

in width, with a similar area on the far bank, the 16th was employed in improving the approaches on both sides. The crossing was effected on the 17th, and we continued east some miles away from the river to the higher ground, on which numbers of Anuak huts were dotted about. In spite of our being accompanied as guides by their fellow-tribesmen, the natives had deserted their homes prior to our advent, and we saw practically nothing of them. A large, dry watercourse, with high, steep banks, joins the Akobo here from the east, which probably has its origin in the Abyssinian Highlands, and is known to the Anuaks as the Owag. We now continued south to the village of Neum, and found that the character of the country underwent a complete change. Those dismal, treeless grass plains so generously furnished with swamp, the monotony of traversing which requires to be experienced to be adequately appreciated, ceased. The banks of the river were wooded with fine sycamore trees, in which hundreds of Colobus monkeys disported themselves, whilst many lovely little birds and butterflies added colour and variety to the scene, which was still further enhanced by the pretty cotton plant flowers. Thence on along the Akobo we traversed well-wooded country, and no longer were hampered by difficulties regarding the provision of fuel and thorn for the construction of zaribas for our transport animals. During the next week we proceeded generally in a south-easterly direction along the river, crossing it several times, and obtained our first view of a hill, at the foot of which we camped on the 24th February. This attains an altitude of 3550 feet; it is a very conspicuous landmark in that flat region, and is known to the Anuaks as Ungwala Hill. It was first previously seen by the Italian explorer Bottego, on the map accompanying the account of whose expedition it is called Ischeno; but it is there erroneously shown on the left bank of the Akobo. The banks of the river were still in several places fringed with swamp, and during the next few days we crossed and recrossed it several times, until we reached a point on the 27th February, where a small stream, known as the Ajibur, which then was dry but contained pools at intervals, enters the Akobo from the Boma hills to the south. The Akobo at that point flows generally from a direction slightly to the south of east, having its origin in the great outlying spurs of the Abyssinian escarpment. Its course had been previously mapped in that direction by Bottego, whose maps are very reliable, and, as I wished to avoid those difficult hilly regions, I decided to try and break new ground by working south and then east round these mountain ranges, with the object of steadily making for our goal Murle, on the river Omo. During the last few days we had obtained occasional glimpses in the early mornings of the higher peaks of the mountain masses to the east of our line of march, the more important points of which I was approximately able to fix, and ascertained that the highest visible point exceeded 8000 feet in altitude, whilst others ranged from 7000 to 8000 feet above sea-level. We were not sorry to part company with the Akobo, as our journey along it, for the greater portion of February, had been singularly uninteresting; for not only was the country traversed devoid of any striking or picturesque features, but we

were practically unable to hold any intercourse with the natives, who were extremely timid and shy, and studiously avoided us on all possible occasions. We had obtained comparatively little shooting, which is often a redeeming feature in otherwise uninviting localities, and beyond an occasional water-buck, harte-beeste, or crocodile, and a few guinea-fowls, ducks, and geese, had not been able to keep the camp pot a-boiling to any appreciable extent. It is true we alighted on elephants several times; but generally on the line of march, when their absence would have made them fonder, as the proximity of these majestic brutes was rather apt to cause panic amongst our transport animals, and we were compelled on two occasions to halt the column to allow them to cross leisurely in front of us. I remembered vividly some years before, when I was conducting a column to the north of Lake Rudolf from British East Africa, an elephant quietly strolled in amongst our animals, some distance in rear of the main body, casually seized hold of one donkey, load and all, with his trunk, and deliberately heaved the whole concern into a thorn-bush some yards distant. Vastly amused at his own gigantic strength being put to such useful purpose, the brute then trotted off trumpeting —but the donkey did not recover.

On the 28th February, then, we bade a long farewell to the Akobo, and struck south, roughly along the course of the Ajibur, an ill-defined stream, the banks in many places being scarcely discernible. We were fortunate in finding pools at intervals, as about this time we were subjected to heavy rains; but the soil was now of a gravelly nature, and the country in parts very charmingly wooded with fresh green foliage. To the west of our route isolated conical peaks, and a ridge from which sprung curious cock-hat shaped eminences enclosed the valley, and formed the water-parting between the stream we were following and one away to the west, known to the Anuaks as the Neubari, which was reported to join an overflow channel of the Akobo, known as the Oboth, and then to turn west into the Pibor. Until we reached the outlying spurs of the Boma hills our progress had generally been pleasant and easy; but when we became involved in this little mountain district it became very laboured and slow. Heavy rains fell, which converted the numerous mountain streams into torrents, several of which had to be bridged, whilst the red, loamy clay became exceedingly slippery, and in other parts boggy tracts were formed, all of which occasioned great delays. We were occupied during the 4th, 5th, 6th, and 7th of March in traversing quite a small corner of this most picturesque district, the scenery of which in parts was magnificent, as fine rocky crags and pinnacles were visible on nearly all sides. The climate appeared to us most bracing after the low-lying swamp-land we had lately passed through, for the average altitude of that district is from 3000 to 4000 feet above sea-level, whilst higher ridges and bluffs attain an altitude of close on 6000 feet. The summits of these loftier heights appeared to be finely timbered, whilst the soil generally was seemingly very fertile. We saw comparatively few natives, as they were very shy at first; but eventually gaining confidence they approached us without too much trepidation, and we were able to make a rapid mental note of their characteristics and

appearance, as we only saw them for a short time the day before we descended again into the plains. We saw no women; but the men were physically finely built, and a higher type of native than either the Nuers or Anuaks. They appeared a species of connecting-link between the Turkana and Suk type, and the inhabitants of the Sobat, Pibor, and Akobo rivers. Essentially a mountain and agricultural race, their limbs were well developed and muscular, the men possessing fine manly faces and open countenances. Many of them wore ostrich feathers in their head-dress, and several had large circular wrist-knives, similar to those worn by the Turkana. Beads were very generally worn, and many of the young bloods had broad bands of red beads, picked out with patches of blue and white ones, fastened across the forehead. Small skin aprons, not unlike those of the Turkana, were in some instances worn by the men. The spears, with small blades and long handles, were generally carried sheathed, with a strip of hide round the cutting edges, and not uncovered like those of the Nuers; but as regards their houses these natives failed lamentably as compared with the Nuers, for their huts were wretched little grass erections with no appearance of stability.

The highest point we crossed in this district was 3700 feet above sea-level—a small plateau from whence we obtained a most extensive view looking west and south-west across a vast level plain extending probably to the Nile and beyond; whilst isolated hills and peaks, springing up at intervals, relieved the otherwise dead monotony of those inhospitable desert plains. From this point we descended very abruptly to the sloping glacis at the foot of the hills, where we camped some 1100 feet below the summit of the pass. We now struck south-west into the plain to avoid the broken ground at the foot of this magnificent rocky escarpment, which continued south for some miles before blending off into a somewhat lower and less formidable-looking barrier of hills. We almost at once got out of the rain zone, and during our progress south over this plain were soon confronted with great anxieties regarding water, in spite of large numbers of zebra, harte-beeste, ostriches, and gazelle being seen hereabouts. On the 10th March we were camped out on the plain on the bank of an insignificant watercourse, which contained a few pools of water, and never doubting but that we must find more ahead, draining the hills to the east, we started off the following morning over this open country. Some six and a half miles from the start we passed a fine large pool; but it was too early to camp, so we pushed on again after a short halt. About midday we began to be a bit anxious, as several likely little groves of palms had been scoured for water, but we could find none. By 2 P.M. we had travelled some seventeen and a half miles, and there seemed no prospect of water on ahead, so I decided to camp as the heat was tremendous and men and animals were becoming exhausted. We had no guide to tell us where water was, and it seemed useless and too risky to continue any further, without reconnoitring; so, as soon as the animals had been unloaded, I sent off our excellent native officer, Mabruk Effendi, and a small party of men, accompanied by five camels and fifteen donkeys carrying water-skins, with instructions to work west towards an isolated hill, as I had reason to suppose there might be

a stream some seven or eight miles distant in that direction. They left shortly after 3 P.M. on their voyage of discovery; but at nightfall no signs of them were to be seen. All that afternoon there had been no water in camp beyond what we three still retained in our water-bottles, for the improvident men had early in the day consumed theirs, and with a pitiless sun beating down on us they visibly began to break up before sundown. The wretched transport animals came sniffing about camp, shoving their noses into the empty buckets, for they too were parched with thirst. Shortly before turning in to bed I was seized with a horrible suspicion that we were on that dreadful desert where Dr. Donaldson Smith's men, the previous year, had for three days suffered such torment for want of water. The idea drove all thought of sleep out of my head, for I now began to realise that perhaps I had despatched that unfortunate party to their utter destruction. Knowing full well the dogged pertinacity of my splendid native officer, I felt convinced that, having the greatest faith in my geographical knowledge of the country, he would probably plod on and on, until he either found the water I had told him was there or succumb in the attempt. All night I sat up in my chair outside my tent, and when the moon came up shortly after midnight aroused a non-commissioned officer and five men, told them to collect all the water-bottles in camp, and return with all speed mounted on six donkeys to the pool passed early that day, fill up, and then rejoin us. That done I felt at all events we could return to that spot, although I hated the thought of having to do so, for the difficulty regarding water ahead would still have to be faced. It was a wretchedly anxious night, and when morning dawned we eagerly scanned the western horizon to see if there was any sign of Mabruk Effendi and his party. There was none. About 7, however, the men shouted out that they could discern distant forms. Through our glasses we saw camels, later men, and then donkeys. Had the search been successful? We could not tell; but their progress was very, very slow. Nearly an hour passed—we could now see that the animals were heavily laden, so water must have been found, and our hopes were raised indeed. At length men and animals reached camp, dog-tired, but they had brought gallons and gallons of water. The joy was almost frantic, and I could almost have embraced Mabruk Effendi. "Where did you find it?" I asked. "Where your honour told me," he replied; and yet what a fluke! A small area of swamp he had come across out on that dreadful plain, perhaps a square mile in extent, and possibly the only water on that barren waste. The men with the water-bottles returned shortly after 9 A.M., and that afternoon we marched some seven or eight miles to the swamp, although my native officer, poor, weary soul, had said he thought it was about twelve miles distant. Several of the men were got in with difficulty, as they had so felt the want of water during the previous twenty-four hours that they were in an exhausted condition. On arrival at the swamp we found a small village, from the occupants of which we learned that the next water south was nearly twelve hours distant, so we had to remain halted for the next two days to recuperate men and animals.

Accompanied by two of the natives we crossed that horrible plain on

the 15th March, and at the end of a twenty-mile tramp struck large pools of water in the bed of the Karuno river. The natives here were prosperous, and the most brilliantly bedecked tribe we met during our travels. They were rich in herds of cattle and donkeys, and possessed numbers of goats and sheep, whilst a few plots of grain were grown along the bank. In general appearance they were not unlike the Boma people; but would seem to be a pastoral more than agricultural race. Though not unfriendly, they viewed our advent with suspicion, and we could obtain no guides from them, for they feared to leave their own country. Until we reached Lake Baringo therefore in August we were left to find our way as best we could, with the exception of a few days during which we were accompanied by Suk youths towards the end of our journey. We were in consequence only able to converse by means of signs with any natives we came across, and for several months had literally henceforth to feel our way through a barren land, not knowing where water would be found nor what obstacles there were before us. It was an undertaking fraught with much anxiety, and before we at length reached the river Sacchi on the 1st April our men had become somewhat unnerved and apathetic owing to our difficulties in connection with finding water, and appeared to anticipate disaster. To continue south over that inhospitable plain after reaching the Karuno seemed to offer little hope of obtaining water, and it was considered advisable to keep near the hills. On the 17th March we continued east towards the escarpment that appeared to bar all idea of further progress in that direction. At first we traversed an open plain, but latterly entered a belt of thorn and camped again on the Karuno, in the sandy bed of which water was obtained by digging. Next day we left the stream and struck south-east with the object of trying to work round this barrier of mountains, and camped upon the slopes of an advanced hill of the main range. We had seen rain falling on it the previous afternoon, and were fortunate in obtaining small pools in the rocky bed of a watercourse on the hillsides. We again continued south until we reached the mouth of a broad valley, thickly covered with thorn trees and bush, enclosed to the south by irregular ranges of hills, whilst to the north a rocky escarpment ran east, at the foot of which we proceeded. At the end of the march we reached a dry watercourse, along the banks of which green trees were growing, and the chirping of many birds, the cackle of guinea-fowls, bush fowl, and partridges seemed to indicate the presence of water. The stony bed was as dry as bone; but we were carrying enough water for the requirements of the men for one day, so in the afternoon search parties were sent out to scour the valley to the south. We were much shut in by hills here, and as by evening one man returned with the information that he had found water in the valley, we halted next day whilst the animals were sent down to drink and to convey water in skins to the camp, and another party was despatched to discover if there was a pass through the hills. The report of the latter party proved satisfactory, and the following day, crossing the pass, we traversed the head of another valley beyond, and continued in an easterly direction as before along the foot of an escarpment. We camped at a point where this ran back north for ten to fifteen miles before turning

east, and then south again, enclosing an open plain swarming with game. We camped without water, but next day struck pools in a watercourse running south—down the centre of this plain. To the east of our camp we observed an easy ascent over a pass some four or five miles distant, through the hills enclosing the small plain, and over this we proceeded with no difficulty the following day.

On arrival at the summit, almost due north of a fine rocky bluff, we obtained our first view of that grand mountain mass, for which the name Naita was given me in 1898, and whose position I had formerly approximately fixed when journeying round the north of Lake Rudolf to the Omo. Its culminating point is a magnificent pinnacle of solid rock, sheer as a steeple, which attains an altitude of over 7300 feet and towers majestically above all surrounding eminences. For the next five weeks we seldom lost sight of this striking feature, and geographers will understand how useful its presence was to me for purposes of survey. As we descended into the plain below the pass, many old friends became visible—mountain ranges and peaks I remembered so well—and I felt that if only there was not this dreadful continued anxiety regarding water, I would have little more difficulty in reaching our goal on the Omo than in finding my way from London to Edinburgh on foot. We traversed this plain in an easterly direction for the next ten days or so, winding our way through hills, over passes, and through thick thorn bush with which this Musha country is very liberally supplied. It was trying work, as we were often landed in the most awkward predicaments for want of water, and several times affairs looked extremely black and unhappy; but Fortune favoured us, and we managed to extricate ourselves. We scarcely saw any natives at all, and although we passed lately abandoned kraals, the occupants of which had evidently driven their cattle, donkeys, goats, and sheep into the bush, we were never able to hold any intercourse with them, as they avoided us like the plague; and, in consequence, we were never able to learn anything about their manners and customs. Eventually, on the 1st April, we reached a running river again, named by Bottego the Sacchi, which has its origin in the lofty mountain ranges to the north of Lake Rudolf, towards which it flows and distributes its waters into a large area of swamp at the head of Sanderson Gulf. In places this stream, whose banks are luxuriantly clothed in a tall forest growth of trees and dense vegetation—the home of many elephants—cuts its way through regular ravines some thirty to fifty feet in depth which have been worn away by the action of its waters in the soft clayey soil. The bed, however, is generally hard, firm sand. We were the first Europeans to proceed along this river since that eminent Italian explorer had revealed the presence of this second river entering Lake Rudolf in addition to the Omo, and we found a somewhat melancholy relic of his expedition. One of the escort walking just in front of me stepped aside into the bush and removed what I thought was a piece of cloth from a small thorn bush. On looking at it, in a corner I noticed a large unmistakable B embroidered, which at once struck me must stand for Bottego. I carefully put it away in one of my boxes; but later, when we had to discard so many of our personal belongings, I must by some grievous mistake have thrown away this most interesting piece

of cambric, for I could never find it after we left Lake Rudolf amongst the few things still in my possession.

On our last camp on the Sacchi—some miles to the north of Nakua—we were out on an open plain, the forest growth having entirely ceased along the river bank; and I now knew that a twenty-mile march across country in an easterly direction should bring us to the Omo river in the Murle district. We had lately experienced rain again, and resting on the 5th April we successfully accomplished this trying march the following day, and found ourselves once again on familiar ground. The natives of Murle were a little surprised at our unexpected arrival, and, had it not been annoying, their laughable terror and the bolt they made for it would have been almost amusing. It was a somewhat serious matter to us, unfortunately, for the stock of food we had brought with us, and which had been most carefully husbanded during our journey, was running extremely low, and we could obtain no information regarding the supplies we hoped might be awaiting our arrival. The natives all cleared off to the opposite bank of the river during the night, and we could never prevail upon them to approach us with any confidence. On the 8th April we continued a few miles east along the river, and I closed my survey from Nasser on this spot, which was the site of the furthest point reached from the Mombasa side in September 1898. The closing error was less than half a mile, which was highly satisfactory, as the original starting-points of the surveys—Mombasa and Omdurman—were some 2500 miles apart by the routes followed. Owing to the absence of supplies, our position was becoming critical, so it was decided to proceed leisurely along the Omo, with the twofold object of purchasing grain from the natives and in hopes of meeting the supplies, which we trusted were being merely delayed on account of the heavy rains which were falling almost daily. The Murle natives would have nothing to do with us, and had placed a great river, some 150 yards in width, between us and themselves, so we next tried the Kerre district, further up stream. Although the natives were somewhat more confiding, they did not seem particularly overjoyed at making our acquaintance, and we could get nothing from them beyond a few small fishes. Crops there were in plenty growing along the river bank, but they were in a very green condition, and quite unfit for food; nor was there any prospect of the harvest being ripe for another two months. Our efforts proved futile, and the extreme gravity of the situation could no longer be concealed. Unless we could obtain food further north in the Mursu district, or were shortly met by supplies, our position would be wellnigh desperate. Before finally formulating plans for reaching safety, I decided one more attempt must be made, as Dr. Donaldson Smith in the previous year had purchased plenty of food in Mursu, so there was no reason why we should not.

We left the Omo and struck across country in a north-westerly direction, to avoid a great northerly bend of the river: and a miserable time we spent midst bog, swamp, and subjected to truly tropical rains. Some of the storms which assailed us at night were terrific, and the Goshen we hoped to find was absolutely deserted. Wandering west through the most extraordinary intricate broken ground, we proceeded along the Omo with great

difficulty; but our labour was all in vain, for we obtained not a particle of food, and our wretched transport animals lost condition most palpably from the daily drenchings to which they were exposed. To continue was useless and hopeless. We must return to Murle, and if the eagerly longed-for supplies had not by that time arrived, our only chance of salvation was to strike south again along the western shores of Lake Rudolf to the British East Africa Protectorate, living as best we could on our transport animals, and trusting to reach a Government post near the Suk country, which we had reason to believe had been lately established by the Uganda administration. By one long and one short cross-country march we were back at Murle on the 22nd April, and camped near our first camp of the 6th April. Of the supplies there were no signs, so I decided to rest the whole column on the 23rd and 24th, and to start on the afternoon of the 25th, as I feared we would never now be able to make one long march back to the Sacchi in the present boggy condition of the country. Beyond some three bags of flour and four of rice, which belonged to the officers' mess, and which was at once made over for the benefit of the men, the latter had little beyond some lentils, rice, and a little flour. On full scale ration the food was barely sufficient for ten or twelve days, and it was more than three months before we were fated to reach safety! During this interval of rest one of our transport drivers mysteriously disappeared, and although search parties were sent to look for him, no trace of him was ever found. He had doubtless gone off on a marauding expedition, been speared by the natives, and his body and rifle thrown into the river. On the afternoon of the 25th April we commenced that dreadful journey to Lake Baringo, undergoing experiences which I fervently trust none of us may ever be called upon to face again. Although time has kindly obliterated from our memories in some measure those horrible months of May, June, and July 1901, it is impossible that we should ever cease to recall at times some of the hardships and anxieties that were suffered. I anticipated a loss, perhaps, of about one-quarter of our men and half the animals; but never in my most pessimistic mood could I have realised that we should only struggle through with 14 of our 59 Sudanese, whilst all the animals that remained to us when safety was reached in August were 3 mules and 44 donkeys.

On leaving Murle we still were only one man short, to whose disappearance I have already alluded above, and our transport animals numbered 11 camels, 10 mules, and 114 donkeys, so our losses hitherto had been comparatively trifling. We only marched some five miles the first afternoon, as it had rained the whole morning and travelling was very laboured. Next day, after proceeding satisfactorily for the first four miles, we became involved in most hateful bog, through which we were unable to take the donkeys. We had to camp on the far side and get all the loads carried over by the men. We were twelve hours on the road the following day before we reached the Sacchi, near our old camp of the 4th April, so our progress so far had been anything but encouraging, for we had taken three days to accomplish what, three weeks previously, had been successfully reeled off in one. This was not the end of our difficulties. The Sacchi had recently overtopped its

banks and formed large areas of swamp, so we were unable to proceed direct to the north end of Lake Rudolf. For the next week we were struggling midst swamp and bog, subjected to heavy rains, and try as we would, we could not penetrate that belt which separated us from the lake shores we were so anxious to reach. At one time it appeared that all further progress south would be impossible, but on gaining the lower slopes of the Lorusia mountains we managed to continue south over dry, stony ground. At length we anticipated we must be nearly opposite Lumian, a former settlement of natives on the lake shore, who in 1898 had succoured my column of 180 souls from an almost equally awkward dilemma by selling us some 70 loads of grain. We hoped against hope that history might repeat itself, and being now south of swamp, struck east again and camped, on the 5th May, on the bank of a watercourse, which I felt must be the one which enters Rudolf at Lumian.

We had scarcely seen a native for days past, but that afternoon a report was brought to me that three of our men were lying dead out on the plains, not a mile from camp, where they had been speared and their belongings plundered. On receipt of this shocking piece of intelligence I sent Dr. Garner out with a strong escort and a camel to bring in the dead bodies, which were interred that same evening just outside camp. This unhappy work was not completed until dark, when we observed for the first time a striking comet in the constellation of Orion. Its appearance caused much discussion, the superstitious Sudanese regarding it as an evil omen. They were perhaps right, for the camp was within an ace of being rushed, shortly after 1.30 A.M., by a band of warriors, who yelled like demons as they charged on our square, assisted by the light of a full moon. The men were all sleeping on their posts as usual round the camp, and as the nerves of the sentries had been highly strung by the afternoon incident, they were especially on the alert. The promptitude of the sentry on the officers' face of the camp, which was that attacked, probably saved our lives, for, shouting to the guard to turn out, this man fired as he gave the alarm, and in less time than it takes me to tell you, the whole of that side of the square were firing for all they were worth at the charging foe. The latter, unable to stand the hail of lead, broke and fled before they succeeded in reaching the line of men. A second attack delivered on the rear face was easily beaten back, the natives leaving behind spears which they had hurled into the camp, but which fortunately had done no damage. It was obvious that the Marle natives, who had been extremely friendly in 1898, were now bitterly hostile, due to ill-treatment they had received from others in the interim. This was a most serious matter, as it absolutely dispelled all idea of our being able to purchase food, as we had hoped, even were there grain at Lumian on the lake shore. Next morning we continued our march east along the khor, and two or three miles brought us to the old camping-ground of happy associations. The natives dogged our footsteps, and although there was a small plot of cultivation in the well-remembered spot, it was quite green, and the heads were not yet even formed. We continued south again for some seven or eight miles to the Komogul khor, and camped on the bank, some distance from the

lake. Thorn was available, so we zaribaed ourselves strongly for the night, as amid the trees and undergrowth round about hostile natives had been lurking all day. We were left unmolested that night, and the following morning camped on the lake shore, on a low sand cliff.

Continuing south, on the 8th May we reached the foot of that striking extinct volcano, Mount Lubur, which rises abruptly some 3000 feet above the level of Lake Rudolf. Here we were obliged to halt for two days, as I became seriously ill with gastritis, which caused such violent fits of vomiting that for two days I was unable to keep anything down. We were off again on the 11th May; but for the next ten days I was compelled to ride a camel at the head of the column to indicate the direction of the march, as I was too weak almost to stand, and was incapable of walking. Latterly our transport animals had become extremely emaciated, especially the camels, who obtained very meagre grazing, and we had begun to kill off the sickly ones, which were incapable of further work, for food. Our progress was dismally slow, for not only were the animals showing signs of wear, but demoralisation began to set in amongst our transport drivers, as all the men were of necessity restricted to a very small ration of grain, and on meat alone they were quite incapable of existing. The regular escort of the 10th Sudanese—a fine body of disciplined men—behaved in the most splendid manner, and they continued their messing arrangements as before, clubbing all their food together, and deriving considerable benefit from their meat, which was well boiled, and a soup in addition obtained from the camel flesh. The ex-dervishes, in their present straits, so little trusted each other that for a time they fed independently, and naturally obtained less benefit from their rations. They gorged themselves in such a bestial manner on every portion of a camel, including the hide, feet, blood, etc., that in a short time they exhibited serious signs of breaking down, and before long our line of march was hampered by ten to a dozen of them being placed on donkeys to ride in rear, as they were incapable of marching. Ultimately, when our losses became so serious that grave doubts arose as to whether we should ever be able to struggle through at all, a combined mess for the whole camp was insisted on, and proved more satisfactory.

On the 19th May three of our Jehadia died, whilst a fourth, in spite of oft-repeated orders against leaving the precincts of camp after dark, went outside the zariba shortly after midnight to take a cut off a dead camel that was lying some 300 to 400 yards distant. He came screaming back with a spear-thrust through his loins, and had to be carried on a donkey for several days, but eventually succumbed to the wound. We were in Turkana country, which we had entered shortly before reaching Mount Lubur, and from my previous dealings in 1898 with these natives I well knew their treacherous and enterprising character, and had almost daily tried to instil into the minds of our men the necessity for never-ceasing watchfulness, but with little success. It will be unnecessary for me to give a detailed description of Lake Rudolf; but in order to obtain a faint idea of the country we were now traversing, I should perhaps say a few words about it. A glance at the map will convey some impression of the

great extent of this inland ocean. It will be observed that from the extreme north end to the south end, the coast-line is not far short of 200 miles in length, whilst the greatest width is about 40 miles. As may be imagined, on such a large sheet of water as this very big seas rapidly get up when a strong wind is blowing, and sitting down on the lake shore on a hazy day with no visible horizon, one can readily picture oneself seated on the seashore as the waves come tumbling in. There is no outlet to this large lake, which forms a natural reservoir in a great depression enclosed on all sides—except to the north—by low ranges of coast hills. That large volume of water is only perennially fed by the important Omo river, which, rising in the Abyssinian highlands, pours the waters of those mountainous regions into Rudolf. At times of very heavy rains other streams enter the lake, draining the hills to east and west; but the Turkwel and Kerio rivers, which in their upper reaches convey large quantities of water towards Lake Rudolf, seldom, if ever, add to the waters of the lake; for the dry, arid, sandy desert, through which they flow north, gradually absorbs the entire volume before the lake shores are reached. The consequence is that the Rudolf waters may in some measure be regarded almost as stagnant, and in course of time it has become so impregnated with sodium and other matters, that its waters are peculiarly unsavoury. It is difficult to get soap to lather readily in it, and when tubbing, the water has a slippery, soapy sort of feeling, and one can almost imagine at the time that one's back is constructed on the same lines as that of a duck. The water has little thirst-quenching properties, but the degree of unpleasantness would appear to vary according to the amount of fresh water that is poured in yearly. In 1898 we found the lake water far less nauseating than at the time I am now telling you about. This was probably due to the great Omo river having run absolutely dry the previous year, on account of the very exceptional drought that rainy season. We noticed that the lake shores were certainly at not the same high level they had been in 1898, and the water was perfectly sickening—more especially to an invalid, as I then was. One of the most striking features of the western shores of the lake is the succession of small lagoons which border the open waters of this sea, from which they are separated by sandbanks—thrown up presumably by the action of the waves. In 1898 these were teeming with wildfowl; now that we were so dreadfully hard up for food, of course there were practically none. It never rains but it pours in Africa, for there were not even antelope or gazelle to shoot. We were not proud, and would have welcomed hippopotami or crocodiles to add variety to camel: but we obtained nothing. The narrow plains extending from the water's edge to the low coast hills, which are generally five to six miles wide, afford grazing-grounds for the powerful Turkana race, who possess numbers of camels, donkeys, cattle, goats, and sheep. They grow very little grain, as the inhospitable nature of these sandy wastes offers few facilities for agriculture; and they are to a large extent dependent on their animals for their milk and food. The males are generally eaten, but the females reserved for their milk and for breeding purposes. These natives thrive well on this diet and are splendid specimens of humanity. One cannot but admire

them physically—mentally they may be very worthy according to their lights, but they exhibit their friendliness in a treacherous manner that the ordinary white man cannot quite fathom. However, we will deal with that phase of their character later on. The many kraals passed during our journey south along the lake were all deserted, and the Turkana had driven their flocks and herds away into the hills bordering the lake, so we did not see a single goat or sheep, though camels were seen grazing in parts. There are no settled villages along the lake, and these kraals are merely temporary sun-shelters rudely constructed of thorn branches, with a thorn fence round the exterior for the pounding of the animals at night-time.

We camped for the last time on Lake Rudolf on 22nd May, and the following day struck south across country to the bed of the river Turkwel, which there was nearly half a mile wide, and both banks thickly wooded with acacias and other trees. Numbers of Turkana were settled along the bank, and we at length prevailed on some of them to accompany us in a friendly spirit up the river bed, which was quite dry and sandy, and to point out to us a water-hole some four or five miles up stream. I was relieved at this turn in affairs, as our caravan was in a horribly debilitated condition, and under present circumstances we did not at all relish the idea of proceeding through Turkana. In 1898 the Turkana of the Turkwel had carried out a guerilla warfare with my strong column of 180 men for a period of a week, and in this thick bush country had caused no end of bother and anxiety by their repeated attacks on us and the transport animals whilst grazing; so it may be imagined that with one-quarter this number of rifles, and the larger portion of the men quite incapable of active work in their present wretched condition, I had regarded the success of our journey through their territory with some misgivings. We now hoped that friendly relations had been established, and that in the future we would at least be left unmolested and free to continue our miserable journey without having the hostility of the natives added to our dreadful worries with regard to food. Our hopeful feelings were abruptly dispelled. When camp had been pitched, and the natives after conducting us to this point had dispersed, the animals were sent out under guard to graze near camp. There was a sudden shout for the guard to turn out, and dashing out to ascertain the cause of this alarm, we learned that the corporal in charge of the animals had been treacherously speared in the bush, the Turkana had bolted with his rifle, and the remainder of the guard were driving back the animals as quickly as possible. The wounded man was carried into camp, but died during the night; so that affair terminated all ideas of peaceful progress through the country. Through Turkana, however, go we must, and the only chance of salvation was to treat these natives as absolutely hostile, exercise extreme caution, and offer as little opportunity as possible for them to do us serious damage. We continued west along the Turkwel, keeping to the open bed of the river, for the banks were thickly wooded and afforded too much cover for an active foe to be pleasant for us. What dreadful slow progress we made it is difficult for me to describe. We crawled painfully along day after day, hampered by ten or a dozen sick

riding in rear, who collapsed sometimes in batches of three and four. It was truly an appalling business; but I do not wish to harrow your feelings, nor recount our daily worries and anxieties regarding the sick and the safety of our transport animals.

When we reached the great bend of the Turkwel we struck south along that river, which before long had a small stream flowing over the bed, and as we proceeded still farther up, this gradually developed into a powerful one, which precluded all idea of continuing any longer up the bed. The banks everywhere were clothed in a tall forest growth of trees and dense vegetation which hindered progress more than I can say. Travelling along the Turkwel was always an unpleasant and anxious period. Apart from never-ceasing watchfulness regarding the proximity of the Turkana, the dense growth of dwarf palms and thorn made it most difficult to know where we would be likely to alight upon the river. To proceed along the bank was impossible; so every day we would have at once to strike away from the river on leaving camp, to get outside this broad belt, in order to continue south along the more open and higher ground, which was also thickly sprinkled with wait-a-bit thorn. Shortly after 11 A.M. we would turn off south-west again with the object of reaching the river bank to camp. This was always the most anxious part of the day's work, for one never knew what dense growth might be encountered, nor exactly where the river would be found, for it takes a most erratic northerly course before swinging east towards Rudolf. With strong, sound men capable of endurance there would not have been the same cause for fear, as one knew that sooner or later one would eventually come upon the river, even if we had to cut our way through to it. But with our wretched, exhausted men it was different. The camels had been consumed before the end of May, and we were all living on donkey now, and these poor, humble carriers provided rations for us all for a space of over two months until we reached Baringo. We slaughtered those that we anticipated would not last out the coming march, and who already had about three of their four legs in the grave. It was poor fare—they were horribly tough, and in spite of running our share of the haunch through a mincing machine, and then currying the result, we never really got to be fond of the gentle moke's flesh. We had no flour, of course, and we would solemnly sit down, with a hearty appetite, to a meal of curried or hashed donkey, and, instead of bread, a couple of gingerbread biscuits each. That was the officers' ration—Major Bright's, Dr Garner's, and mine. The men, in place of sweet biscuits of some sort, had about three ounces of either rice, lentils, or grain. None of us naturally put on much weight, and the men were so debilitated, that we always felt that if we were delayed beyond midday in reaching the river, we should have more collapses. Even by the 2nd June our men were reduced in numbers from fifty-nine to thirty-eight, no less than twenty-one men having already succumbed to sickness and exhaustion, and to the spears of hostile natives; and it was still to be another two months before we reached safety. Our subsequent progress may be better imagined than

described. On the 11th June we reached the outskirts of the Ngaboto district, which was densely populated by Turkana, who hereabouts cultivate plots of ground on the river bank, and are more of an agricultural race than their nomad brothers farther north. These fields were quite green and the crops anything but ripe, and we obtained no food from the natives. Our condition was becoming most desperate, and if Marich and the Suk country failed us, there seemed little prospect of more than ten or a dozen of the whole expedition struggling through to the Ribo post, which we fondly hoped now was little more than ten days to a fortnight distant.

Continuing next day again through Ngaboto we saw the last of the Turkwel river, which just north of the 2nd degree of north latitude is joined from the south by the river Weiwei—the latter draining the Suk mountains, whilst the former, arising in Mount Elgon to the west, cuts its way through the Chemorongi mountains before issuing out on to the Ngaboto plains. We still continued south, proceeding now along the Weiwei, which we crossed on the 13th June, and began to breathe again, as we were now out of Turkana country and trusted we had seen the last of those treacherous natives. That evening on counting over the animals we found that a donkey was short, so the grazing guard were sent to hunt up the animal in the long grass where they had been grazing. Presently we were alarmed by most piercing screams of terror, and, rushing down to the river crossing, found the best of our few remaining Jehadia lying dead mid-stream. Of his assailants, of course, nothing was seen, and when we at length brought his body ashore we found he had received four spear thrusts, any one of which would have been fatal. We carried his body off to inter it with that of another man who had died after we camped early in the afternoon. Mabruk Effendi and I brought up the rear of this sad party; but we had barely proceeded twenty yards from the river bank before I heard sounds of men, as I thought, wading across the river to our bank. Beckoning to Mabruk Effendi to follow me, we doubled back, loading our rifles as we ran in a stooping position, as we fervently hoped we should have the pleasure of knocking over some of these hateful Turkana. On reaching the crossing a solitary donkey emerged from the water, brushed roughly past us, and proceeded in an unconcerned way to the camp where his companions were pounded for the night. The grim and ridiculous must be very closely allied, for, in spite of the horrible tragedy we had just witnessed, Mabruk Effendi and I caught each other's eyes and involuntarily smiled on being confronted with the innocent cause of it all. We had been worked up to shooting down all the Turkana we saw, instead of which we were compelled to allow ourselves to be jostled by a donkey! We halted next day before traversing the No-Man's land between Turkana and Suk. More than half our men were dead now—only twenty-nine remained of the original fifty-nine—whilst our transport animals consisted of five mules and seventy-six donkeys. I have not previously mentioned that long before this we had burned, buried, and even sunk in Lake Rudolf a great deal of our equipment and stores at various times, to lighten the work of the men and our animals.

We now left the Weiwei river and struck in a south-westerly direction to the foot of the mountains. This march, in spite of the comparatively easy nature of the country traversed, proved the most disastrous one of the whole journey. No less than six men succumbed, in spite of the previous day's halt and rest, whilst a seventh was brought into camp in a comatose condition and died before we marched next morning. We had reached a powerful mountain stream issuing from a gorge in the hills, and whilst a camp was being pitched I shot two vultures. There was a sudden rush for these loathsome carrion, and to my utter astonishment the men proceeded to pluck, boil, and devour these filthy scavengers. I think that fact will describe more eloquently than any words I can write the straits the men had by this time come to. We still continued along the broken slopes of the mountains in a southerly direction, and again experienced difficulties regarding water before we reached the most northerly Suk settlement of Sekere—four more men dying on the road. Here for the first time I noticed an extraordinary number of purple spots all over my legs and body, which I showed to Dr. Garner, thinking they must be some curious form of heat rash. They proved to be the initial stage of scurvy in my case, and before the month of June closed I became so virulently attacked by this disease that I nearly succumbed to it, and at one time my life was despaired of by our medical officer. A few days later hæmorrhages of all my mucous membranes set in, and for many weeks I was never free from the sight, taste, or smell of blood, as my very saliva had been converted into it owing to the dreadful condition of my gums, tongue, and throat, whilst incessant nasal hæmorrhages so weakened me that I became utterly exhausted.

On the 20th June we reached the longed-for Marich, but were bitterly disappointed to find that the smiling fields of corn I remembered in 1897-98 were no longer existent. Long, coarse grass had sprung up, and the natives, though friendly, appeared in a very parlous condition themselves for lack of food. We now for the first time, since striking the Karuno river in March, obtained the services of a guide for a few days—a Suk youth who had a slight smattering of the Swahili language, and informed us that he knew the site of the Ribo post. On reaching Weiwei we abandoned some twenty donkey-loads of gear, intending subsequently to send back for these from the post, which, we were told, was only some four marches distant. Continuing south along the foot of the hills through the Chemtulell and Kivas districts, in the latter of which we managed after great difficulty to purchase some fifteen to twenty pounds of grain, we reached an atrocious piece of country some five miles south of Kivas. Here our Suk youth quietly gave us the slip whilst tending our small flock, which was out grazing with the transport animals 'midst the long grass by which our camp was surrounded. His absence was not discovered until the evening, when the animals were all brought in as usual for the night. It was then found that not only was he missing, but seven of our milch goats also, and we now had only five sheep left. Parties were sent off to hunt up that wayward youth, but of course nothing more of him was ever seen in this thick country. "It

would lessen half my pain could I think we'd meet again" on this earth, for I should like some day to resume my acquaintance with that young scamp, as I think he might have cause to regard that meeting as a red-letter day in his brief existence.

We struggled on with great difficulty, for no paths could we find in this long grass and coarse vegetation. The lower slopes of the hills were much broken by numerous watercourses flowing through small ravines, the banks of which were almost perpendicular and clad in dense vegetation. For two days our progress did not exceed five miles, and we eventually reached a point amidst plots of cultivation in the Ndao district in a state of collapse. There were only seventeen men left now, and we merely had the few pounds of grain that we had purchased a few days previously. Our animals were thoroughly exhausted after the recent climbing they had to indulge in, and my condition caused Dr. Garner much anxiety owing to my great loss of blood and consequent prostration. That was the 28th June, and for the next twelve days we remained halted at this secluded spot, and after the first three or four days succeeded in purchasing grain from the natives in exchange for the flesh of our few remaining sheep, which were slaughtered. When these heads of grain had been dried in the sun and winnowed, we found ourselves possessed of some six and a half bags wherewith to face the remainder of the journey to the Ravine station. We calculated that this amount would allow a ration of half a pound of grain per man per diem for a month, supplemented as usual by donkey meat, by the end of which time, if all went well, we trusted we might reach safety. In the existence of the Ribo post we had now given up all hope, for every dawn and every night, when all was still, we had fired signal shots, in the faint possibility of the echo, reverberating through the hills, being conveyed to some helping hand which might perchance be seeking our whereabouts. It was all in vain.

On the 10th July we struggled on again, crossed the Kerio river, and for the next few days proceeded in a south-easterly direction across the Suk plains towards the head of the Karuan valley, which rises in the low hills bounding the plains to the south. By great good fortune we hit off the pass through the hills and found water at intervals along the bed until we reached Kisite on the 20th July. Our progress had been slow, as we were detained for several days owing to severe relapses of nasal hæmorrhages, to which I was still a martyr. Despite this fact, three more of our men broke down, and our following now only numbered fourteen blacks. Here at Kisite, where we camped on pools at the mouth of a gorge issuing from the hills, I suffered the most severe relapse of all, and for a week hovered between life and death. In addition to nasal hæmorrhages, fresh exacerbation of hæmorrhages into the cellular tissues of face, shoulder joints, and other portions of my body took place. My face became bloated and puffed up; my vision was rendered almost useless, and I became nearly stone deaf. In the bitterness of my spirit I would almost have welcomed death to free me of so much suffering, had it not been that the lives of the few remaining survivors were dependent on my knowledge of the country to guide them

through to safety. Fortunately we obtained the services of another Suk youth, as large numbers of these natives daily brought their flocks and herds to be watered at the pools on which we were camped. He also had a slight knowledge of the Swahili language, and from him we learned of the existence of a post at the south end of Lake Baringo. We doubted his veracity, for not long before another youth knew where the Ribo post was—so he said. We were glad, however, of his assistance, so started off with him on the 29th July, when I was sufficiently recovered to undergo the agonies of riding a donkey. On the 31st July we reached the north-west corner of this small lake, and from here we parted with the youth, who agreed to take a note by the eastern shores to the post, whilst we continued along the western as being the more direct route to Njempo, for we placed little reliance on his report regarding the proximity of Europeans in the immediate neighbourhood. Shortly before 10 A.M. on the 2nd August we had reached the dry bed of the Ndo stream, some miles from the margin of the lake, and were resting under trees prior to pushing on again to reach water before camping. We had thought little more of the note, but presently some of the men came up and reported that a white man riding a pony was approaching, accompanied by men carrying small bags of flour on their heads. After all the dreadful disappointments we had experienced the news appeared too good to be true. The white man was soon, however, in our midst, and proved to be Mr. Harold Hyde-Baker, the Collector of the Baringo district. That indeed was a happy meeting: but I must not dwell on that delightful hour we spent, feeling that at last we were saved. The effect of his presence was magical, and acted as a charm on all.

We were still a long distance from his post, so we started off again at 11.30, but it was 6 P.M. before we reached it, and yet the weary men with light hearts cheerfully tramped 18 to 20 miles in their then exhausted condition, crossing three streams and driving the few remaining donkeys and mules before them. And what a feed they had that night! A splendid ox was slaughtered for them, and they enjoyed such a meal as they had never tasted for many an unhappy day past. No more donkey. The idea appealed most forcibly to us all. We were sick and tired of the poor fare which had been our portion for so long, and how we blessed Hyde-Baker for his untiring energy in hunting us down. He had started off an hour and a half after receiving our earnest appeal for help the previous day, and had tramped many miles in search of us. All was changed now. For the next twelve days we passed a peaceful existence on the summit of the isolated hill at the south end of Baringo on which Hyde-Baker had established his post, during which time the men and ourselves regained health and strength in some measure. On the 14th August, fully equipped with fresh transport animals, and some twenty to thirty of Hyde-Baker's own men, we commenced our further journey of 75 miles to the Uganda railway at Lake Nakuro. Walking was out of the question for me for some weeks to come, so I was carried in a hammock, and Dr. Garner, who was suffering from an enlarged spleen, rode a mule. With fresh men and animals to help, our progress was quite different to what it had been before, and

we reached Nakuro on the 21st August. Here we remained for three days with Mr. J. P. Wilson, the sub-commissioner, who was most good to us; and on the 24th started on our railway journey of 450 miles to Mombasa, where we arrived on the 26th. Two days to traverse the extent of country, which in the pre-railway days used to occupy us as many months of weary tramping.

Our journey through Africa was now at an end, and there merely remained the voyage by sea and land back to Cairo, where we eventually arrived on the 28th September. Two days later I accompanied the few remaining survivors of the escort to Assuan, where they rejoined their regiment, and met with a most moving and stirring reception. The whole battalion was drawn up at the station awaiting the arrival of the train, and such a cheering, and lu-luing on part of the Sudanese women, as these splendid black fellows were greeted with, must have gone far to obliterate, in some measure, the memory of the hideous experiences they had undergone. The band played them back to the lines they had marched from some ten months previously, and they were the heroes of the hour. On the 3rd October I wished my most excellent native officer, Mabruk Effendi, and his fine men good-bye, and the following day rejoined my companions, Major Bright and Dr. Garner, at Cairo, where we experienced much kindness and hospitality during the four or five days we spent there. On the 8th October we took train to Port Said, caught the P. and O. steamer homeward bound, and set foot again in London town on the evening of the 15th October 1901.

EDINBURGH AND ITS REGION, GEOGRAPHIC AND HISTORICAL.

By Professor Patrick Geddes.

Every city, every culture centre has two aspects—one general, and the other special, local and regional. We may first approach it from the standpoint of the general culture of the world, the common heritage of civilisation, and ask how far it continues and represents this. Mathematics, for instance, chemistry, physics, and the like, are by the nature of the case peculiarly independent of the immediate surroundings of their workers; not so, however, subjects like physical geology, palæontology, marine zoology, archæology, in which local advantages and disadvantages are obviously of fundamental importance. Our second question is thus, how far are these utilised—with its practical corollary, how much farther may this utilisation be profitably carried?

The view from the Castle Hill, from the Calton or Salisbury Crags, reveals the geological advantages which Hutton, Playfair, and their successors so fully utilised. Like the excavations of Montmartre to Cuvier, like the living memories of the Border to Scott, these are the natural quarries of facts which this and that architectonic mind has

utilised for its great constructions. But are our resources thereby exhausted?

The culture problem of a great university city more especially, and of its learned societies in particular, may thus be usefully viewed from these two standpoints alternately. These two foci, at first apparently distinct, are soon seen to be complementary. For we can best and most fully share in the world's culture as we utilise our local and regional advantages, as we know and overcome our special difficulties or disadvantages, as of geographical position or the like; while reciprocally we can in the future as in the past best contribute our part to this general culture by developing our local possibilities to the full. But since to a university as a whole, as to most of its faculties and subjects, the general world-culture is most important, the utilisation of local and regional advantages is still but rarely considered. In certain smaller continental universities here and there it is becoming seriously considered, witness Montpellier, or among minor centres, Marburg or Clermont or Grenoble; and here also lies one of the most immediate problems of higher education in Scotland.

The various scientific societies have, it is true, more or less recognised this double aspect of their field, and endeavour to keep up with general science on the one hand, while exploring regional phenomena on the other; yet probably no scientific society, in Edinburgh or elsewhere, can as yet be named which has fully faced both problems for any one department, still less for all.

Where is this problem especially attackable? Obviously in some city with learned societies and university at once on a sufficient scale fully to participate and be ranked in the general world-culture, yet on the other hand sufficiently isolated from its greatest centres to make this investigation more practicable and less involved than in these. And if so, is not this problem manifestly one for the Scottish Universities, for Edinburgh, and particularly for the Scottish Geographical Society, at each of its centres, but first of all this main one? Are not its library, its map-room, natural centres for such a double inquiry?—presenting as they do on one hand a general outlook into the world in all its regions and countries, in all its phases of civilisation and their products of culture, and on the other, the materials, the methods, and the beginnings of a Regional Survey; the hope therefore also of such regional interpretation as should naturally evolve from this, such aim and impetus to action also.

This idea is no doubt a common, or at least a spreading one; to the writer it has always seemed in theory especially important, and for action especially influential. For to any one who has definitely followed the occupation of the wandering student, it is at once the problem and the economy of life not to roam in a desultory way, but to find and occupy for a season as naturalist a sufficient number of the world's characteristic scenes, as humanist some characteristic standpoint in each of the centres of world-culture, historic and actual, from east to west, whence to look out more fully upon the general stream of human evolution under these conditions, and so comprehend more fully the regional contribution of

that centre to the whole, the reaction of the whole upon it. This is a form of travel, it may be of exploration even, as real as that which is more commonly brought before geographical societies ; and as the world grows better known in its elemental and cosmic aspects, it is this later culture-aspect which will claim and find increasing place. It is already a generation since the geography of the unknown continent occupied almost exclusive place in the curiosity and imagination of geographers ; the Arctic, even the Antarctic, pole must soon lose much of its fascination ; but in compensation for this the human, the social, the regional value of geography correspondingly reappears. And in this opening field of science, just as in geology or physical geography, there is probably no region or centre in the world on the whole more favourably situated than Edinburgh.

In the past century the science of geography has been renewing her youth. As at the Renaissance, she has felt again the cosmic thrill of snowy peaks, the mystery and the terror of the tropical forest maze ; she has enjoyed the danger of adventure in lands as yet unconventionalised by communications and commerce. In youth let our wandering student enjoy all this while yet he may, let him seek to know at first hand all he can of simpler races, of older culture peoples also, from the Indians of Western or Central America to the heterogeneous peoples and religions of the East. Yet as his thought goes on developing he will recognise more and more fully that there is more to be seen and learned, more to be observed, interpreted, discovered, in modern Constantinople than in ancient Cyprus ; more human variety in a slum of modern Chicago or New York than among the heterogeneous peoples and languages of Mexico.

His range of travel thus narrows in latitude and longitude, but deepens proportionally in other ways, less obviously measurable, perhaps, yet also coming within the scope of science.

As one becomes less of a traveller, one may be more not merely of a tourist, but of a student also. Leaving then the great mountains, the primitive forests, the open seas, the simplest peoples, yet keeping these in mind as the permanent background and source of the human stream with its two-sided evolution of thought and action, our travels begin anew. Planning our concrete survey, it must extend from the early culture-cradles of Asia, Egypt, Cyprus, and the rest, through nearer and later ones, through Phœnicia, Israel, Hellas, and Rome, and thence through mediæval and modern times, seeking to develop and realise with increasing fulness our apprehension of each culture period in turn, of each social formation, seen if possible from its centre, but also from its tidemark in this remote corner of the historic world. All this we must appreciate, but where shall we go to digest our general culture, at what specific place shall we settle ourselves if our ambitions tend rather in some measure to solve and to unify the problems of life than to take part in its greatest centres of activity ?

These greatest centres, despite all their favourable conditions, are too vast for adequate comprehension : they were more intelligible in earlier generations than in our own, when the Londoner can no longer

know London or even the Parisian know Paris. The geographic and the historic features, the historic perspective, the atmosphere, are of course still there; but they are no longer so easily grasped, still less so easily retained amid the intensity of modernism, the pressure of daily affairs. The oldest capitals, like Athens or even Rome, are too much dominated by their past; while in the youngest the past is not sufficiently manifest, even Berlin, or Petersburg being if not more modern, at least less obviously infused with the historic spirit than Boston.

In no great culture centres can there be a real lack of resources; and even in the newest or the smallest of towns its dwellers may find links enough with the past, life enough in the present, hope enough of the future, to supply a fairly complete outlook; and from the regional survey of social formations be able to construct a not inadequate idea of the larger world. Yet one place presents more advantages than another. The first of Volcanic Observatories is naturally on Vesuvius; of Seismographic, in Japan; the Meteorological Stations of Puy de Dome or Ben Nevis, the Zoological Stations of Naples or Roscoff, of Plymouth or Millport, are each strategically situated; and similarly one place may be better for the geographic and historic student than another.

What are the conditions of this sociological outlook? The natural environment—latitude and configuration of land and sea, climate, life, and natural productions—not only conditions human population but determines its fundamental activities. These activities determine institutions, and these in turn determine customs and laws, ideas and ideals; yet ideals in turn profoundly modify, if not practically redetermine all. Hence our geographico-historic student should place himself if possible at some centre where the survey of the natural environment, yet also of the influence of ideals is relatively complete, and also relatively simple and clear. Where shall we find such a centre? From the tower of Galata, with its sublime outlook over the meeting-place of Asia and Europe, with its once focal city, the connection of world-geography with world-history is supremely apparent; yet here the side of idealism is not manifested upon the same great scale,—is relatively deficient, despite the code and church of Justinian; while its mediæval and its subsequent Mohammedan order is too remote from our own. It is as the pilgrim of Hellenism, of Hebraism, or of earliest Christianity, that one visits Athens and Jerusalem, not to stay there; and this overshadowing of the present by the past is too powerful even in Rome, and makes Italian cities, to the foreign visitor at least, centres more convenient for history than for general sociology. We return to Paris and to London; but here again, as we have seen, their vastness and complexity interfere; we may make the general survey we require more fully and easily in minor cities, best of all, perhaps, in a survey of the Netherlands. Once more we return to our own city, disappointed in many ways it may be, yet seeing more and more clearly with each return the conditions of the vast problem before us, and more nearly prepared to formulate and analyse it.

Here around us first of all is the needed physical and geographic

background. Here is the cultivable agricultural plain with its hill-pastures and forest; here the quarry and the mine; here the fiord, the inland river: here the great natural roadstead and port, the fisheries. Here around us, in short, and visible wellnigh from every window and street crossing, is an amphitheatre of social evolution, in essentials as complete in geographico-economic interest as it is rich in picturesque variety. For what are the geographic conditions of social life, civilisation, and history? We must picture for ourselves an intelligibly small yet representative section of the earth's relief, from mountain to sea; we must clothe this at each level with its appropriate verdure, from Alpine vegetation down through poor hill-pastures to rich; from the conifers to the deciduous and fruit trees; from oat or rye down to wheat-field and rose-garden; we must follow, too, its streams from source to sea; from millwheel to ship-laden tide. In this great amphitheatre we must study man's struggle for life, at first in direct contact with nature, as hunter and fisher, shepherd and peasant, woodman and miner: and thence trace the complex development, yet enduring influence, of these elemental occupations into our modern industrial division of labour, with its specialised science and law, or into current literature as into older folklore.

In each respect, whether of natural environment or of human activity, we shall find cities more advantageously situated than Edinburgh. Many have far greater mountains than our little Pentlands, and sublimer snows than the Bens of our western view; others have happier hunting-grounds, pastoral steppes far excelling our poor hill-sides, agricultural plains by which our fertile Lothians are but small. Others again boast their rivers, their seas richer in fish, laden with richer argosies. Forests immeasurable, mines inexhaustible must be sought elsewhere; elsewhere, too, we shall find industries and arts more developed. Each, then, will be in its way a better place than this to see and to investigate; yet here in Edinburgh in another and a fuller way is perhaps the best of all. Here at any rate is a rare advantage: that of having under our eyes in one not too extensive scene the main aspects of temperate nature, the main activities of man, and this throughout the main phases of history, primitive and ancient, mediæval and modern. Here then we can both specialise and generalise by turns, the first with greater ease, the latter with greater safety and completeness, controlling our general abstract views by continual return to the observation of our literal and concrete ones.

Our region, then, if not indeed exhaustive, if not quite an ideal microcosm of geography, is yet an exceptionally complete approximation to this, in all its aspects,—physical, political, commercial, and the rest.

The representative relief-section of natural environment from hill-top to sea, with its associated series of elemental occupation, is in itself not uncommon, but is rarely so complete and so accessible near any considerable city; not everywhere can we descend from the isolated pastoral hamlet to the isolated fishing village in the course of a single afternoon's walk, passing through mining village and peasant village on the way, and meeting most types and varieties of occupation from

hill-shepherd to hotel-keeper, ploughman to florist, trout-fisher to sea-fisherman and trawler, forester and miner to shipbuilder, sportsman to whaler, and so on. How historically different phases of occupation may survive together is also here curiously brought out;—witness the express train and cable tramway, yet with woman as primitive carrier in the fishwife trudging beside them; witness at the Forth Bridge, not only the competing railway and stagecoach, but the old Queen's Ferry by which one may still pass.

The dramatic contrast yet intermixture of antique and modern in the Old and New Towns which gives its characteristic aspect to Edinburgh, may also be followed beyond architecture into occupations. The modern printer and publisher, the vendor of broad-sheet and ballad and chapbook are still in the same street; there are college class-rooms where the dictating of lecture-notes still goes on as before the days of printing; and as before the days of gunpowder, the Royal Company of Archers are still shooting at the butts in one park, while Queen's prizemen are at practice in another.

More or less of this is of course to be found in every historic region and city; but seldom is so full and dramatic a set of contrasts crowded into one narrow region. Hence one type of native mind, one type of visitor also, sees only the historic, the romantic aspect of Scotland; another type, another visitor, the utilitarian and the economic, and this no less truly. Here in Lothian or there in Fife, as similarly in the west, we have economic regions long self-centred and still largely self-contained, fertile enough to yield adequate subsistence, yet stern enough also not to yield this without exceptional effort, exceptional economy. The high reputation of the Scots gardener, the high standing of the Scottish insurance companies, are they not thus akin?—both going back to the same struggle of man with nature, the same peasant economy and foresight, shrewdness and calculation.

The change from Sicily or Naples to Edinburgh or Aberdeen has obvious disadvantages enough; yet at each notable stage of the journey northwards, with its longer winter, its paler sun, a higher intensity has been developed in the contest with nature; so that in the bleak northern country we find not only the most perfect culture of the rose, but that here also has been worked out under glass even the production of the finest grapes. Of the mastery of Nature what better symbol?

The romantic and feudal associations of Scottish scenery and history have had their natural interpreter in Scott; yet no less also have their equally characteristic economic developments found voice in Adam Smith. It is thus by no mere coincidence that Scotland should have produced the supreme creative and initiative intellect of modern economics, and also of modern romanticism, but as normal though consummate developments and expressions of these two so strongly marked aspects of region and of life. But it is the strife and the resultant of these two streams of thought and tendency that make up what is most characteristic in the history of the nineteenth century throughout Europe; and hence the main advantage of our sociological region is its varied contact not only with elemental nature

and the historic past, but with modern and actual life. Just as Sir Archibald Geikie has lately expounded the natural advantages for geological studies of St. Andrews, and has pointed out that no university in Europe, not even Edinburgh, possesses so great and representative variety of educative excursions within easy reach of the student, so a similar case may be made out for central Scotland as an almost ideal region for sociological studies. Every tourist—and a tourist is the amateur, the empiric observer with whom concrete sociological studies largely begin—makes the first, the most obvious of all these interpretative excursions when he interprets the conditions and the activity of Sir Walter's mind by Melrose and the Eildon Hills, in Old Edinburgh or by Loch Katrine. But in the same way the student will find a new light upon classical pages of *The Wealth of Nations* when he reads them after a ramble along the shores of Fife to Kirkcaldy. Again, we may explore with the antiquary's spade, if not with the folklorist's note-book, the terraces of Arthur's Seat and the crannog of Duddingston; or coming to later times, we may gather a wealth of ethnological, sometimes historical tradition, from the place-names around us. With the Roman antiquary we may reconstruct a reasonably clear idea of the occupation of the district; with Dr. Skene or Dr. Anderson form some idea of the general drama of the Celtic period; or with Mr. Stuart-Glennie's *Arthurian Scotland* claim for our immediate environment no trifling share in the origination of the noblest romance cycle of Christendom. Passing the long line of shadowy kings in Holyrood and coming to firmer historic ground, we may utilise that long historic procession designed by Mr. Burn Murdoch, or that executed by Mr. Hole for the National Portrait Gallery. Nor can any historic lesson be imagined more vivid, more intense, more picturesque, and more constructive than the actual embodiment of such a procession in actual pageant as in the admirable proposal of the first-named artist; for from this vivid scene, with its local colour once fixed in the memory and imagination, it would be easier far to build up alike in the student's mind and in the popular consciousness the conception of the corresponding types and periods of general European history and progress, associating, for instance, Queen Margaret with the Norman Conquest of England, the "sair Sanct" and the Douglases with the rise of Catholicism and of chivalry in general, the Stuarts with the ancient league with France, Rizzio or the Admirable Crichton with the refinement of the Renaissance, as Gavin Douglas with its poetry and George Buchanan with its scholarship, or as Knox with Calvin and Luther, Lindsay with Hutten and Rabelais, and so on.

There are thus three planes of study of Scottish history. The first is that of the simple patriotism of the early historians, or still of the enthusiastic boy; next comes the conventional English point of view, in which, for instance, the wars of independence are but minor and unfortunate episodes, delaying, and for longer than the '15 or the '45, the inevitable and desirable unification of the island. Here as yet most remain; but beyond this there is a third stage, that in which Scotland is viewed no longer either as an isolated and independent unity, as with the first, nor yet, as with the second, as practically the mere outlying

"mutton-bone of England," but is at length truly and fully seen upon the general map as the region which in geography, race, and history on the whole most fully represents and epitomises north-western Europe; and which is hence one of the richest and most fascinating fields for the student of social geography, of general and comparative history, whatever his country or race may be. Hence it is that Scott and Smith have appealed to all the world.

The field is still far from exhausted. Thus the historian is accustomed to trace the centralisation of feudalism under royalty in France and in England, the converse escape of feudalism from imperial control in Germany. Each country in its way thus attained to a comparatively more settled order than Scotland, of which the strangely intense and dramatic history has to be explained, not by mere survival of barbarism, nor by accident of genius, as we may prefer to imagine, but by the geographic circumstances which prevented definite victory to either Stewarts or Douglases, barons or king; as they had prevented definite Roman, Norse, Norman, and English conquest in the previous generations. Nor is this merely ancient history, as the tourist, the modern Scot, is wont to think: like all ancient history, it has its immediate effects in obvious process around us. How, for instance, shall we explain the actual geographic distribution of political leadership that we have beneath our eyes? From the Castle rock we can see the actual constituencies, or, still better, the actual home of a quite extraordinary proportion of the political leaders, the governing forces of the nation, and of the great regions and dependencies of Empire throughout our memory; how shall we explain this? How better than by actual regional persistence of political intensity from the old wars and intrigues of the long royal minorities, through the plots and counterplots of the Reformation, through the intensity of Cavalier and Puritan wars, through the Jacobite risings and their long-surviving hopes and plots, until the advent of the present political and representative era. It is this long survival in semi-independence, in unsubdued ambition, which now manifests itself in the political leaders, in the viceroys, whose homes lie so largely within immediate actual sight. Similarly, the converse type of Scottish prosperity, the canny form of "getting on" as distinguished from the adventurous one, has found its discipline, and no small element of advantage throughout troublous centuries, in avoiding entanglement, and quietly attending to immediate affairs. We thus get a fuller explanation of that paradoxical contrast in the national character which has given the foreigner and the Londoner such widely different ideas of Scotland and the Scot. To the first, who has known chiefly the Scottish adventurer, "*fier comme un écossais*," "*hospitalier comme un écossais*," even "*généreux comme un écossais*," are to this day surviving proverbs; while the Londoner, who has naturally suffered from the competition of the canny type of emigrant, has not unfrequently found other epithets more satisfying.

Leaving the environs and entering the city, one is naturally at first struck by its feudal aspect, and visits the Castle and the Abbey upon which its mediæval character depends. Passing thence to a brief glance at Glasgow, we find its happily well-preserved focus in the Cathedral: its

second focus, a municipal one, in the belfry of the Trongate. We have thus in Edinburgh and Glasgow a convenient pair of types, contrasted and complementary in the past as in the present—that is, an exceptionally good starting-point for the comparative study of mediæval and modern towns. Here in fact is the clue, too seldom seen by the citizens of either, to the interpretation of the contrast of the two cities and their comparative isolation from each other to this day. One is still the traditional and the romantic, the administrative and the legal capital—that is, the Royal Castle to this day, yet the Abbey also, for since the Reformation Edinburgh has been more than ever the religious and speculative centre of Scotland. The other is of course the virtual capital, with its intenser modern life, its vast and varied industrial activity, its maritime and commercial enterprise, its civic statesmanship and initiative. But this is only our modern and unhistoric way of saying that the independent citizenship expressed by the antique belfry has here specially survived, and has hence more readily developed to its present eminence among the municipalities of the world. Yet may not Glasgow claim a more direct and applied ideality and spirituality also? The contemplative tradition of the Abbey has survived or reappeared in the theologians, the philosophers, or men of science of later Edinburgh; but the more active and secular intensity of the western Cathedral has also gone on expressing itself, at one time in a missionary saint like Livingstone, at another in a virtual bishop like Norman Macleod, or in our own day is seeming to reawaken in an efflorescence of art, such as few cities have seen since the days of the cathedral-builders.

Returning once more to Edinburgh, and still more after a longer journey through England or the Continent, one recalls abbeys far statelier than Holyrood, far finer churches than St. Giles, law courts more important, universities more productive, it may be even nobler castles, and so on. Yet the interesting fact remains, that here are all these things at once, and more, and all in measure. In short, just as we have in this region a peculiarly complete geographic and occupational environment, so we have still within the narrow limits of the historic city, its mile of length, its quarter to half a mile of width, probably the most condensed and most complete sociological section to be seen anywhere in the world —the most condensed outlook, that is, of geographic and historic development, and this at every plane from the hill-fort onward, yet with none of these vast enough to dominate all the rest as in a fortress city, a cathedral city, an industrial city, a commercial city, or a university city commonly so called. For there is probably no other city possessing all the essential and historic organs of a national capital, preserving something at least of all the substantial landmarks of historic evolution, which is at the same time practically almost concentrated into the narrow limits of a single street, and even this is two distinct towns, the Royal and the Abbatial, Edinburgh answering to London City, and Canongate to Westminster respectively; and these till a generation ago with the corresponding circle of outlying minor burghs.

This variety and completeness within moderate compass is what is all important to the general student, who needs to see representative

types and not to be overwhelmed by excessive vastness, or misled by the excessive predominance of any one type to the exclusion of others. Starting then with the primitive hill-fort, the "dun" not of Edwin but of Dun-Edin, at safe yet convenient and protective distance from the port, originally only the tiny sub-estuary of the Water o' Leith, we may trace the phases of subsequent development; even from those traditional primitive and matriarchal phases of civilisation which have left their mark in the hind and damsel who support the castled shield, the anchor crest of the city, or in legends as of the "Castrum Puellarum." For the patriarchal order, clan traditions are not far to seek; while of the Roman and barbarian, of the earlier and the later mediæval periods, we have already spoken.

Though the first aspect of the city is mediæval, the Renaissance is not wanting. The evolution of Abbey into Palace, and of this, and the Castle also, into what are practically museums, is but one small and incomplete example of what has taken place in Florence or in the Louvre upon a greater scale; while the university owes many of its characteristic differences from its fellows of the middle age to its establishment as a seat of the new learning. Nor is it needful here to enlarge upon the intensity of the Reformation struggle, or upon the wars of Puritan and Cavalier, of Jacobite and Hanoverian, the strife of Whig and Tory.

Coming to nearer times, the Industrial Revolution, the Political Revolution, have alike their conspicuous monuments, witness the juxtaposition of Hume's mausoleum, of the "Martyrs' obelisk," of tall chimneys. Again leaving the city for the region, we are midway between Glasgow and Newcastle, and can thus readily appreciate and interpret the age of steam-engine and locomotive, of coal and mechanical invention. In Edinburgh itself there is more industrial activity than is popularly realised, while the contemporary political evolution also is not without its monuments, its still sometimes national campaigns of rival parties.

Upon the contemporary age of Empire we have already had a brief and partial outlook. The most casual observer sees how much of the local colour of the city is due to regiments which have ever been the cutting-edge of imperial war, and feels how nowadays corresponding to this, as of old to the royal, the religious, or the romantic order of things, we have a no less intense development of the associated order of ideas also, with its appropriate idealism. Similarly in the most modern, the Financial order of things. The Banking and the Insurance world are here on a fully sufficient scale of importance as well as of antiquity to reward the student: nor are yet more modern developments far to seek.

In a word, then, all phases of culture—ancient, mediæval, and modern—are singularly well represented, alike in institutions and in material monuments: and to these the city owes its aspect and interest. Were we to build a model city, for purposes of geographic, historical, and social demonstration, we should have to begin again with Port and Hill-fort, with Castle and Abbey, with Palace and University, Art Galleries and Museums, with Parliament and Law Courts, with Factories and Railway-stations, and Technical Schools, with Bank and Newspaper-office, with

Geographical Society and Historic Portrait Gallery. And correspondingly with the spiritual evolution from age to age, through all the intensity of successive religious developments and transformations.

Granting this interest in the past, this completeness in the present, is nothing to be discerned of the future? In the deepest sense the past is still here in the present: but this present is already great with the future, and this not merely latent, but incipient. A renewed study of Scotland, of Edinburgh, would reveal to us each as no mere accumulation of historic survivals, but as historic centres of initiative also. Nor has this process, however apparently arrested, necessarily therefore come to an end.

Such then are some of the ways in which we may justify the establishment of a Sociological Station for Edinburgh and its immediate environment. A germ of this needed Regional Institute of Geography and History has for some years past been beginning its development, of course as yet very imperfectly and incompletely, in the Outlook Tower. To continue these beginnings, to develop this rudimentary social observatory towards adequate scientific completeness, and to utilise it in research and in education is thus a task demanding only moderate resources and a not unattainable amount of specialist co-operation. And to do this would be of interest and value, not only for city and environs, but as an example of the regional portion of such a National Institute of Geography as that indicated by Mr. Bartholomew and the writer in the March number of this Magazine.

THE SWEDISH ANTARCTIC EXPEDITION.

SOME NOTES OF ITS FIRST MONTH OF WORK.

By Otto Nordenskjöld.

In the following lines I intend to give some general information about the work and the chief results of the Swedish Antarctic Expedition during its first month in the Antarctic.

The expedition arrived at Buenos Ayres December 16th, and stayed there five days. Here the two last members joined the party, viz., the American artist, Mr. F. W. Stokes, a member of the Peary Greenland Expedition in 1893-97, and the Argentine lieutenant, Mr. J. M. Sabral, who was to take part in the magnetic and hydrographical work. On the last day of the year we arrived at Port Stanley, and from there proceeded to the Argentine observatory at Staten Island. The wind being contrary we did not arrive till the 6th January. Unfortunately the work of the observatory had not yet commenced, so the instruments could only be compared to a very small extent.

From Staten Island the course was set direct for the South Shetlands, which were first sighted on the 11th of January. The land first seen proved to be King George Island, a high island covered with ice and snow to an extent I had never expected in that northern

latitude, even after the older not very encouraging reports. There being no place suitable for landing on its northern shore, we proceeded to Nelson Island, where we landed in the Harmony Cove of the charts, our first anchorage in the Antarctic regions.

The snow-free land was not very extensive, but we made good collections of the plants—mosses, lichens, and algæ—and some insects. The rock in places was a porphyritic lava, perhaps of the same mesozoic age as the corresponding rocks in the Cordilleras. No recent volcanic rocks were found even as boulders.

We now steamed for the mainland, where the work was to begin in the region of the hitherto unexplored Orleans Inlet. We hoped to find a passage through to the east, but we soon found the inlet bending to WSW., and passing in an almost straight line between a coast-line that seemed uninterrupted and a chain of big islands, we arrived at an island which seemed to us identical with Two Hummocks Island and Cape Murray of the map of the Belgica Strait, constructed by Captain Lecointe.

Though very anxious to stay in this region in order to make a thorough survey, we here turned back to our principal field, the Atlantic coast of the land. Passing along the coast of Louis Philippe Land, we entered on the 15th of January the strait between this and Joinville Land, where we had an opportunity of making very important corrections of the existing maps.

It was a most interesting thing to compare the Pacific and the Atlantic side of this part of the Antarctic land-mass. The former is formed by high, jagged mountain ridges, and the rocks are, as already known through the Belgian Expedition, intrusive masses or schists. The east coast, on the contrary, has to a great extent a plateau-like character; the rocks are for the most part basaltic, but tertiary sediments seem also extensive.

We only landed a few times, and then continued our voyage to the south. Between Cape Lockeyer and the Seal Islands there was fixed land-ice, but we discovered a high, mountainous land far to the westward. The ice now began to be troublesome, as the wind, which had been easterly, had pressed it up against the land. A little south from 66° S. Lat. we found it impossible to proceed farther, and it being still too early to prepare for the winter station, we resolved to follow the edge of the ice-pack eastwards in order to explore it.

For about twenty days we continued moving along in this way, effecting soundings and hydrographical and zoological work. The continental shelf is rather broad even at about 66° S. lat., a depth of 1000 metres being found at a distance of 120 miles from the shore-line. On this shelf the water is exceedingly cold, with a temperature of 0° C. only at a depth of between 400 and 500 metres. Outside of this shelf all our soundings gave results between 3000 and 4000 metres, with the depth slightly increasing towards our easternmost sounding in about 45° W. long. The temperature of the water is below 0° C. until a depth of about 175 metres; at the bottom it is between $-0°{\cdot}7$ to $-0°{\cdot}5$ C. The temperature seems to be a little higher farther east, and it is not

impossible that the deep indentation in the ice where Weddell and Ross reached their farthest south corresponds to a part of the sea with comparatively warm water.

The summer being now far advanced, the weather foggy and rather bad, and the necessity for starting the work of the winter-station pressing, we resolved to return to the place best fitted for this work of all we had seen, viz., the region south of Cape Seymour. During the 10th and 11th of February there was blowing a hurricane-like wind from the SW., and only on the 12th could we start unloading, at a place selected in Admiralty Inlet, at the margin of the great Snow Hill glacier. The geology here is very interesting; the rocks contain numerous fossils, mostly Ammonites of a Cretaceous type, the first time that this formation has been found in the Antarctic.

The members of the winter party are Dr. Nordenskjöld; Dr. G. Bodman as meteorologist and magnetician; Lieutenant Sobral, assistant magnetician; Dr. E. Ekelöf, physician and biologist; and two sailors. It is our intention to continue the work at least until 1st January 1903. During the fall, as well as especially in the spring, September to November, I intend to explore by means of sledge expeditions as much of the vicinity as possible, with the special intention of fixing the outlines of what is to be considered as the mainland, and to follow this as far as possible to the south.

Our steamer *Antarctic* now proceeds as soon as possible to the Falklands, with a full scientific staff staying on board. During the winter, scientific and especially hydrographical and zoological work, is to be executed round the Falklands and between those islands and South Georgia. At about the end of the year the ship may be expected back at the station. At that time our reconnoitring work ought to be finished, and if circumstances permit we intend to try again to penetrate the pack-ice and proceed as far as possible to the south. It is to be hoped that we shall be able to extend the limits of the known territory for a good distance, though it is not probable that we can reach a high degree of latitude, as it seems that the region east of Graham Land is in that respect one of the most difficult on the earth.

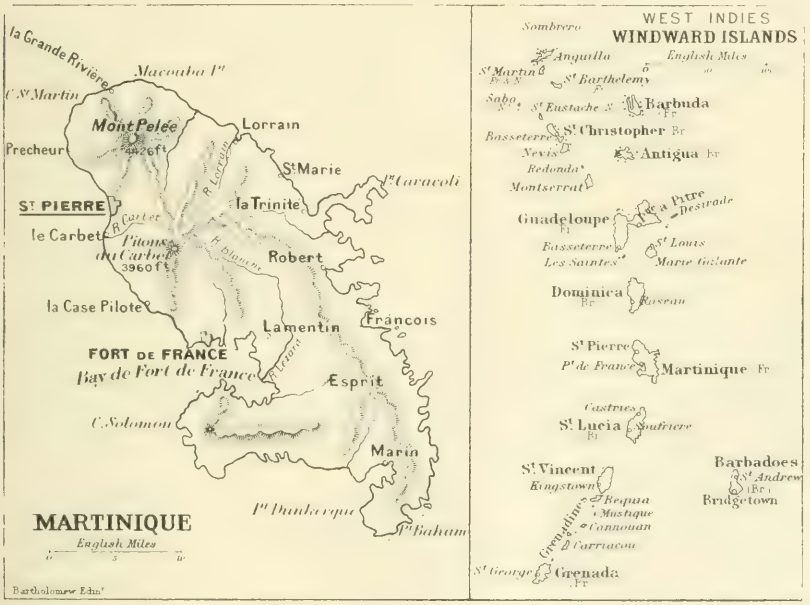
We do not intend to pass a second winter in the Antarctic. Before we return, I hope, however, to meet in the work the proposed Scottish Antarctic Expedition, headed by Mr. Bruce. There is no doubt that this expedition will find many most interesting problems to solve.

THE DISASTER IN THE WEST INDIES.

We publish this month a map of the island of Martinique, whose chief town has been recently destroyed by a terrible volcanic eruption. The same disturbance has also affected the volcano of the neighbouring island of St. Vincent (see map), as well as producing seismic shocks in others of the Lesser Antilles.

The island of Martinique is some 49 miles long, and at its middle point is 13 miles wide. Like the neighbouring islands it is of volcanic

origin, and is distinctly mountainous in character. The highest mountain, known as Mount Pelée, reaches a height of nearly 5000 feet, and until 1871 was regarded as an extinct volcano. In that year there was a slight eruption, but since that date the volcano was quiescent until the sudden and disastrous eruption of May 8th, which completely overwhelmed the populous town of St. Pierre. Near the summit of the mountain there was a crater lake—Las Palmistas—and above this a sugar-loaf peak surmounted by a cross, which formed a celebrated viewpoint. The town of St. Pierre was placed on the level ground at the foot of Mount Pelée, some five miles distant from it. Though not the seat of government, St. Pierre was the largest town of the island, and with its suburbs probably contained about 30,000 persons, of whom



1000 to 2000 are estimated to have been white or of mixed blood, and the remainder negroes. It would appear that the neighbouring towns and villages, such as Le Précheur, Le Carbet, and others, have been involved in the same destruction as St. Pierre.

The other important town of Martinique is the capital, Fort de France, with about 16,000 inhabitants and a very fine harbour. It is situated at a distance of ten miles from St. Pierre, with which it is connected by a fine hill road and by a regular service of steamers. The whole island is fertile and populous, and before the catastrophe had nearly 200,000 inhabitants, mostly negroes or of negro descent. Since the partial decline of the sugar industry, formerly of prime importance, the cultivation of coffee and cocoa has greatly increased, while other exports are tobacco, cotton, rum, and logwood. In addition to the trade with Europe in sugar, cocoa, coffee, and so on, St. Pierre has carried on

a thriving business with the English islands, especially St. Lucia, Dominica, and Barbadoes.

Although, as indicated above, Martinique has been singularly free from volcanic eruptions until the present catastrophe, it has been frequently affected by earthquakes, no less than 200 shocks having been recorded in 1843. In the eighteenth century many of the shocks were severe.

The volcanic disturbances of Martinique have been repeated, apparently on quite as disastrous a scale, in the British island of St. Vincent, where the volcano of Souffrière has shown alarming signs of activity. Prior to 1812 this volcano had been quiescent for nearly a hundred years, but in April of that year a tremendous eruption took place. In the present instance signs of activity appear to have presented themselves at about the same time in the volcanoes of Martinique and St. Vincent.

St. Vincent is 18 miles long and 11 miles broad. Souffrière is its highest peak, and reaches a height of about 3000 feet. The capital of the island is Kingston, with a population of about 5000. This town is apparently uninjured by the eruption, but the whole of the northern end of the island has been devastated, and all living creatures within a certain area entirely destroyed. St. Vincent is one of the most depressed commercially of the West Indian Islands, and so recently as 1898 was visited by a terrible hurricane.

We hope to publish in an early issue a scientific account of the nature and causes of the recent disturbances, but as yet the human aspect of the catastrophe has naturally absorbed the whole attention of the observers on the spot, and there has not been time to arrange and sift the limited amount of evidence obtainable.

PROCEEDINGS OF THE ROYAL SCOTTISH GEOGRAPHICAL SOCIETY.

Meetings in May.

On the 8th May, in Edinburgh, Major H. H. Austin, C.M.G., D.S.O., Royal Engineers, read a paper entitled "A Journey through the Sudan to the Indian Ocean." The Chair was taken by Colonel Cadell, V.C.

On the 29th May, in Edinburgh, the Rev. W. Campbell read a paper on "Formosa under the Japanese." Mr. W. B. Blaikie presided.

Meeting of Council.

At a meeting of Council held on the 22nd May, the Honorary Diploma of Fellowship was conferred on the Hon. A. C. Gregory, C.M.G., etc.

Scottish Antarctic Expedition.

Surgeon-Major Black has subscribed £1, 1s. to the Scottish Antarctic Expedition.

GEOGRAPHICAL NOTES.

EUROPE.

The Crypto Depressions of Europe.—Under this title M. I. Cvijic gives an account (*La Géographie*, v.) of those lakes of Europe whose bottom sinks below sea-level. Such lakes occur to the north and the south of the Alps. In the north they are confined to such regions as have recently been subjected to glaciation. In the south they are limited to a region on the margin of the Adriatic. Of the last a good example is the Skutari lake, situated in Western Albania. The lake basin, together with the surrounding plain, is placed in a depression, and the plain shows numerous signs of recent subsidence. In the longitudinal valleys and the lowest parts of the plain, the level is such that the underground water appears at the surface in the form of lakes and pools. The Skutari lake itself must be supposed to have originated in the same way by subsidence below the level of the underground waters, and even below sea-level. The surface of the lake is six metres above sea-level, but much of the bottom is below sea-level. Along the south-west border there occur remarkable funnels ("entonnoirs"), of which one is 44 metres deep, and also steep rocky islets, both of which are evidence of marked subsidence. The funnels occur at depths of 2-5 metres, have a diameter of 20-80 metres, a depth of 8-44 metres, and are locally known as "oka" or eyes. The author believes that they are submerged *dolines* such as occur in parts of Bosnia. Lakes of the type of Skutari occur in various parts of Albania and in Dalmatia, and are all to be ascribed to the same cause—subsidence of the land. Some of them are salt, *e.g.* Lake Prozura, owing doubtless to a subterranean communication with the sea. All are in intimate relation with the depressions of tectonic origin which have given the region of the Adriatic its present form. Very different from these are the lakes north of the Alps, whose bottom similarly sinks below sea-level. These, as already stated, only occur in glaciated areas. The extent of lake-bottom below sea-level diminishes in passing from the north towards the south, but is usually greater than that of the lakes of the Adriatic region. The shape is very different from the lakes of the Adriatic, and closely resembles that of the Scandinavian fiords. In brief, these lakes are valleys and valley-systems which have been moulded and deepened by the action of ice, and differ strikingly as to origin from those bordering the Adriatic.

Temperature of Hungarian Salt Lakes.—Prof. v. Kaleczinski has found that the temperature of the water at various depths in certain lakes in Transylvania shows very remarkable variations. In the vicinity of Szováta there exist numerous small lakes which owe their salinity to the presence of rock-salt in the surface soil of the district. They may contain as much as twenty-five per cent. of common salt.

In the Medve lake, the largest of the group, whose average depth is 10 metres, observations on the temperature give the following results: At the surface the temperature varies with that of the atmosphere, and in summer is 20-30° C.; below the surface the temperature rises gradually, and at a depth of 1·32 metres reaches its maximum of 56° C.; after this it again falls, and is 30° C. at a depth of 5·32 metres. The other lakes show similarly a median zone of water of high temperature between two zones of lower. The author believes that this is due to the action of the sun in the presence of a layer of water of low salinity lying on a layer of high salinity. The temperature of this latter layer is greater the greater the difference between the salinity of the two layers, and the point of maximum temperature (at 1·32 metres) is also the point of maximum salinity. The hot water of Medve Lake is used for baths and for industrial purposes, and the author believes that similar hot water could be produced in other European salt lakes by introducing a superficial layer of fresh water.—*Geographische Zeitschrift*, viii.

ASIA.

Exploration in Central Asia.—In *La Géographie* (v.) an account is given, with a map, of the journeys taken by Lieutenant Kozlov in Tibet. After having explored the Mongolian Altai and the Gobi desert, the party found their way to Eastern Tibet, where they reached the village of Tcherkou, in the vicinity of the hypothetical boundary-line separating the arid plateau of Tibet from the hill country in which rise the great Asiatic rivers (Yang-tse-kiang, Mekong, Saluen, etc.. In point of fact Kozlov found that to the north of a ridge, which is probably the prolongation of the Bayan-Khara of maps, the country has still the characters of the Tibet plateau, being arid with but little vegetation, and no permanent human inhabitants. To the south of the ridge, the character of the country changes suddenly. Here are peaked mountains, with deep valleys and ravines, which in the basin of the Upper Mekong are covered with pine forests, juniper with occasional birch, and wild apricot and apple. Birds abound, and monkeys make their appearance. The inhabitants are Tangoutans, and are divided into a northern nomadic group, and a southern stationary group, who chiefly cultivate barley. The village of Tcherkou is of some importance on account of its being on the direct road to Lhasa. It contains a large convent.

The expedition obtained large collections, botanical, geological, and zoological, and made a large number of observations both on the country and people.

Sven Hedin's Expedition.—In a letter to his publisher (F. A. Brockhaus), the Asiatic explorer gives some account of the material which he has accumulated during his recently concluded journeys. He has covered some 10,000 kilometres of ground, and 9000 of these lie in new country. His map is in 1076 sections, and he has obtained thousands of photographs, while his notes are so extensive that in writing his book the difficulty will be to cut down and condense sufficiently. The explorer expects to reach Stockholm in the beginning of July.

AFRICA.

West Africa.—Mr. John Middleton of Old Calabar informs us that much survey work has been done recently in the country in which the Aro Field Force has been operating. The positions of Arochucko, Bende, Owerri, Akwete, and Oguta (on the Niger) have been fixed, and this will give a much better idea of the extent of country which lies between the Niger and the Cross river. The last named is not

adequately shown on existing maps. It rises in the Kamerun, drains the stretch of country between Old Calabar and the German boundary, and joins the Calabar river a little below Old Calabar. It is a fine river, but very shallow in the dry season, when it contains in some places not more than two feet of water. At Obokun on the river there is a very fine waterfall. It is probable that the Government will establish a new station on the river on a piece of high ground at Obubra in place of that which previously existed at Ogurede.

West Africa.—The monthly dinner of the London Chamber of Commerce was in April last followed by a discussion on West Africa, in which Sir Harry Johnston took part. He pointed out that although the Foreign Office has never shown itself unsympathetic as regards scientific research in our African possessions, yet the carrying out of such work has been hindered by the reluctance of the Treasury to expend money. Sir Harry Johnston believes that, if in past decades some £20,000 had been expended in the scientific examination of East Africa, the Uganda railway might have been constructed for about half a million less money. If some such sum as £20,000 could now be expended on three scientific explorations in West Africa, East Africa, and British Central Africa, it would probably result in the amassing of all necessary information as regards products, soils, minerals, natural history, and human races in those regions. The fact that Britain is much behind France and Germany in the scientific examination of territories under its control cannot be ascribed only to the want of sympathy shown by the Treasury, it is much more an expression of the indifference of the nation at large to scientific research.—*Times.*

Geological Survey of Natal.—We have received from Mr. William Anderson, Government Geologist, the *First Report of the Geological Survey of Natal and Zululand.* Mr. Anderson has been much hampered in his work, first by the war, and second by the fact that he has no assistant, but the report shows that a considerable amount of work has been done. The volume includes a general introduction, a historical sketch of previous work with a bibliography, a report of the preliminary survey of Zululand, one on the survey of the Lower Tugela district, together with some other reports.

It is interesting to note that in the Drakensberg rock shelters occur quite similar to those found in Australia. The walls bear representations—often coloured—of hunting scenes and of natural history objects. In Natal, Swaziland, Zululand, and Orange River Colony there occur rudely chipped flint implements, which merit careful study. The author emphasises the especial need of a survey of the coal-fields, for without this their economic development will be checked. The coal-seams are of very limited lateral extension, and are often penetrated by intrusive volcanic rocks, in such a way that without detailed geological surveying the working of the beds becomes a matter of much difficulty. As yet practically nothing has been done in the way of correlating the seams of the different parts of the coal-fields. The report on the geology of Zululand contains an interesting account of the topography of the region, together with a geological map.

African Exploration.—In the *National Geographic Magazine* for April, Mr. Charles Rabot gives an interesting account of recent explorations carried out by the French in Africa, including the Marchand expedition. The paper is illustrated by some very fine photographs, those taken by M. Flamand in the vicinity of Insala being especially interesting, as are also those of desert scenery by M. Foureau.

Mr. W. Fitshugh Whitehouse, Jun., and Lord Hindlip arrived on March 23 at Gildessa on the frontier of Abyssinia. They left England at the beginning of the year with the intention of journeying from Zeila to the Upper Nile, and when the despatches left them were in good health, and had been able to secure abundant transport. At Jibuti they were joined by Dr. Victor Bell, and after a stoppage at the capital of Abyssinia proposed to resume their journey either *viâ* the Sobat or the Blue Nile. On leaving Adis Abeba it was Mr. Whitehouse's intention to spend a month in the "devil-infested" region of Walamo in order to investigate the cause of the native belief that the country is infested by demons.—*Times.*

AMERICA.

Future of Alaska.—C. G. Georgeson gives a brief summary of the resources of this state. Experiments have shown that it is capable of growing barley, oats, and wheat, and all the hardier kinds of vegetables, and that cattle are likely to do well. The author compares the country to Finland, which is only about one-quarter of the size, and has a population of over 2,600,000 souls, and expresses the opinion that Alaska would easily support a population of three millions. The agricultural development of the state would, he believes, be of great assistance to the mining industry in reducing the cost of living and improving means of transport. The reason why the development of the country has not hitherto been rapid he ascribes to the difficulties which have been put in the way of settlers desiring to obtain land. If this difficulty could be removed, progress would be rapid.—*National Geographic Magazine.*

American Progress in Cuba.—In the *National Geographic Magazine* for March there is an interesting series of photographs of parts of Habana intended to illustrate the improvements which have been made in the city since the American occupation. The photographs in several instances show parts of the city both before and after the occupation. Apart from æsthetic improvements, the paper accompanying the photographs shows that the sanitary conditions have greatly improved, and that there has been a corresponding improvement as regards the death-rate. During the years 1889-99 the average yearly mortality from yellow fever was 440. In 1901 the fever season—April to January—passed with only five deaths from this cause. The first piece of work undertaken by Major Black and his staff was the cleansing and disinfecting of *every* house in Habana, whether small or large. The sewers were then thoroughly cleansed and repaired, insanitary property pulled down, the public park planted and improved, and rendered safe by efficient lighting at night, the streets repaired and drained and disinfected with electrozone, which is manufactured very cheaply from sea-water, and has been extensively used in Cuba. Finally, a sea-wall and promenade have been built at a cost of about 10,000 dollars. All these improvements have been carried out with Cuban money, but apparently without the approval of the inhabitants. The writer of the article anticipates that their ultimate result will be to convert Habana into "the most popular of American winter resorts."

AUSTRALASIA.

Memorial to Captain Flinders.—On April 8th there was unveiled on the Bluff, at the summit of Rosetta Head on the coast of South Australia, a tablet intended to commemorate the meeting between Captain Flinders, the explorer of the South Australian coast, and the French national ship, *La Géographe*, on April 8, 1802.

The French ship was commanded by Captain Nicolas Baudin, and on board Flinders' ship—the *Investigator*—was John Franklin, the Arctic explorer. Captain Flinders described the meeting in his book entitled *A Voyage to Terra Australis*, and gave the name of Encounter Bay to the spot in which it took place. The memorial consists of a plate of gun-metal with an inscription, and has been erected by the South Australian branch of the Geographical Society of Australasia.—*Times*.

POLAR.

Scottish National Antarctic Expedition.—Mr. Bruce has been fortunate in securing the services of one of the oldest and ablest whaling captains, viz., Captain Thomas Robertson. Captain Robertson, who was born in Peterhead, has resided for the last twenty years in Dundee, whence he has sailed regularly every year for the Arctic regions. In 1892-93 he sailed as Captain of the *Active* to the Antarctic regions with the Dundee whaling fleet.

During this important voyage, Captain Robertson not only performed all the arduous duties which befall a whaling captain, but also made important geographical discoveries. Joinville Island, previously mapped by D'Urville and Ross, he discovered to be two islands, the southern and smaller of which he named Dundee Island, and the two portions of the strait separating the islands he named Firth of Tay and Active Sound. He also landed, and collections were made by his Surgeon and Naturalist, Dr. Donald. For this he received an honorarium from the Royal Geographical Society. He has in addition also made discoveries in the Arctic regions. Captain Robertson comes from an old whaling family in Peterhead. Both his father and grandfather were whaling captains in their time, so that from infancy he has been associated with Polar work. In all his eventful and dangerous career, Captain Robertson can look back with satisfaction to the fact that during that time he has never lost a ship or a single man.

German South Polar Expedition.—We have noted in these pages from time to time the progress of this expedition, the notes having been based on the cablegrams which have appeared in the daily press, or the longer accounts found in the scientific journals, but it is desirable to call attention to the full account of the journey to Cape Town which appears in the first number of the *Veröffentlichungen des Instituts für Meereskunde und des Geographischen Instituts an der Universität Berlin*, a publication which has been recently added to our list of exchanges. The paper contains a full account of the scientific observations made on the journey from Kiel to Cape Town by the various scientific members of the expedition, as well as a general account of the passage, and Dr. Enzensperger's report of the Kerguelen Station, summarised in our last number. During the stay of the expedition at St. Vincent, a topographical survey was undertaken by Dr. Emil Werth, the geology was studied by Dr. Emil Philippi, and the botany by the former author. Dr. Emil Werth identified a considerable number of marine algae and of flowering plants from the dunes, the valleys, and the rocky regions. Only on Mont Verde is there any considerable amount of cultivation. Here the author found large quantities of sweet potato (*Ipomoea batatas*), maize, a species of *Cajanus* (pigeon-pea), gourds, a fodder-grass, sugar-cane, bananas, and agave. The last named also grows wild. In other parts of the island cultivation is scanty, but cocoa-nut and date palms occasionally occur, and various trees and shrubs are planted in the town of Mindello.

During the passage from the Cape Verd Islands to the Cape numerous

observations were made, both on physical and biological subjects, all of which are detailed in the report.

Antarctic Exploration.—M. Adrien de Gerlache, the Belgian navigator whose expedition to the South Antarctic five years ago attracted the attention of scientists, is contemplating another voyage on a more extensive scale. M. de Gerlache hopes to leave one of the French ports in September next year, when a vessel will be fitted out at the expense of a French capitalist.—*Times.*

GENERAL.

Glaciers and Glacial Phenomena.—M. Charles Rabot, whose work on northern glaciers we noticed recently, has published an interesting address delivered by him to the French Alpine Club. He points out that the total area at present subjected to glaciation may be roughly estimated as equal to twenty times the area of France, the area consisting largely of the Polar regions, while the glaciers of the great mountain ranges, even when added together, form a very inconsiderable part of the total. Glaciers in general fall into one or other of two well-marked types, the Alpine and the Polar. In the former, in a representative case, the glacier originates in a snowfield formed in a depression surmounted by a cirque, out of which the glacier flows as a true river of ice, occupying a depression of the surface. On the other hand, in the Polar type the glacier forms an enormous cupola—a lake of ice—from which great ice-streams flow out towards the lower grounds. In the Arctic the ice-cap is best developed in Greenland, where it was crossed by Nansen in his famous journey. Less is known of the apparently enormous ice-cap of the Antarctic, though the expeditions which have been sent out and are in prospect will no doubt add much to our knowledge of glacial phenomena in the south.

In the northern hemisphere the most important glaciers occur in Scandinavia, Iceland, Spitzbergen, and Greenland, in relatively low latitudes. Their position shows that it is not a low temperature which is the only cause of glacial phenomena,—there must also be abundant precipitation and frequent clouds. It is the mingling of the warm waters of the Gulf Stream with the cold currents of the Polar basin which largely accounts for the severe glaciation of north-west Europe. A similar cause has produced the extensive glaciers of Alaska, which are of a special and peculiar form. As in the paper previously noted, the author also discusses the fluctuations of glaciers, and in addition gives some account of the work which they do, especially as agents of transport.—*Revue de Géographie,* xxvi.

Regina Margherita Observatory.—A short description with a photograph is given in *Nature*, April 17th, of this observatory, which is placed on the Gnifetti Peak of Monte Rosa at a height of 4560 metres. The observatory is fitted up for scientific work of various kinds, an important element being the physiological laboratory, which, under the care of Professor Mosso, has been equipped for the observation of the physiological effects of high altitudes upon man.

We welcome the first number of the *Finnländische Rundschau*, a periodical which is to be devoted to the interests of the intellectual, social, and political life of Finland, and is intended to make manifest the mental activity of the people, and so show how much would be lost by the complete Russification of the country. All who sympathise with the smaller nations must wish long life and prosperity to the new enterprise. The publishers are Duncker and Humblot, Leipzig, and the contents are entirely in German.

We are informed that the German Association of Natural Philosophers and Physicians will hold its seventy-fourth annual congress at Carlsbad on September 21-28. As on former occasions, the rule that lectures and debates may be carried on in any language will be followed, and foreign visitors will be accorded the same privileges as the ordinary members of the Association. Inquiries should be addressed to the Association at Carlsbad.

COMMERCIAL GEOGRAPHY.

Progress of Liberia.—A *Times* correspondent gives a glowing account of the resources of this Republic and the progress which it is making. It has a coast-line of some 380 miles, broken by several fine rivers navigable for boats of light draught for 25-100 miles into the interior. The vegetation is luxuriant, and many of the plants are of commercial value. In addition, the country contains mineral resources of great value. Within thirty-five miles of the capital (Monrovia) large deposits of graphite, iron, and gold-bearing quartz occur, while coal is found within four miles of a navigable river, and but twenty-five miles from the port. Natives have brought to Monrovia from the interior cinnabar carrying a high percentage of mercury, and also galena and lead containing silver. None of the minerals have been worked by the "ancients," and the Liberians, who are largely descendants of freed slaves from the Southern States of America, are very ignorant of mineralogy. The Liberians number about 30,000, and are thoroughly Anglo-Saxon in their sympathies; the native population probably exceeds 1,500,000. The chief exports at present are coffee, ginger, palm kernels, rubber, ivory, pissava, camwood, and cocoa, but owing to the absence of railroads, only the districts within three days' march of the chief towns have as yet been tapped. With Europe there is communication by an English line of steamers running to Liverpool and a German line to Hamburg. The latter line is making strenuous efforts to obtain a monopoly of the export trade, and offers the merchants much greater facilities than the British one. France and America have both resident political Consuls, and Germany has recently followed suit; but Britain has intrusted consular duties to the Dakkar Consul, who at that distance can be of little use. The appointment of a resident Consul at Monrovia is a step which it is to be hoped the British Government will take before it is too late. Recently the Liberian Government has granted a valuable charter to an English Company, and it is to be hoped that the result of this Company's operations will be to increase British interests in this undoubtedly rich, fertile, and interesting country.

Irrigation in the Canaries.—In the seven islands which constitute the Canaries more than a third of the total surface is useless for purposes of agriculture. This is in part due to the nature of the soil, the altitude, and so on, but even in the fertile regions agriculture suffers much from the want of water. There is no navigable river, no considerable stream even, in the islands, and the water obtained in the rainy season is husbanded with the most jealous care. There exists in the islands a very elaborate system of irrigation, whose origin is lost in the mists of antiquity, and which was already in use when the Spaniards arrived in the islands. In addition to this system of distributing channels, numerous artificial ponds exist, but in 1898 a Company began the construction of an enormous reservoir in the Grand Canary, intended to hold 800,000 cubic metres. The reservoir is formed by a dam built between two hills across a valley through which runs a considerable winter torrent. The dam is 120 metres long, 30 metres high, and has a thickness at the base of 25 metres, thinning at the top to 4 metres. It

will be finished within a few months' time, and has been constructed entirely of materials found in the island. It is anticipated that the result will be to greatly benefit agriculture, and in all probability other similar works will follow. The reservoir is in the vicinity of the little town of Arucas, which is the most important centre for the growth of tomatoes, bananas, and sugar-cane.—*Le Mouvement Géographique*, xix.

The Cape to Cairo Railway.—This railway has been surveyed as far as the Zambesi, where a great steel bridge, having one span of 500 feet, will carry the line across the river at the Victoria Falls. The whole section from Bulawayo to the Zambesi —275 miles in length, or nearly 1700 miles from Cape Town—is expected to be opened next year. Locomotives for contractors' purposes are now running on it for a short distance north of the present terminus, and a railway exploration party has been despatched over the railway route beyond Victoria Falls as far as Tanganyika. For 40 miles north of Bulawayo the earth-works are more or less complete, bridging work on the Victoria Falls section is in progress, and about five miles of line are finished. The work of connecting the Bulawayo and Salisbury sections is also progressing rapidly, and rails are already laid from Salisbury to Sebakwe, a distance of 60 miles. From the Bulawayo end of this line, the railhead has reached the Arguza river, so that when this gap is filled in and the line completed, trains will be able to run from Cape Town to Delagoa Bay *viâ* Bulawayo, Salisbury, and Umtali.—*Times.*

Planting in French Congo.—M. C. Chalot reports on the experiments which have been made at Libreville as to the plants which are likely to thrive in this colony. The soil generally consists of a mixture of sand and clay ; though rich in nitrogen and phosphoric acid it is poor in chalk, magnesium, and potassium. The best results have been obtained with cacao. The species tried has been that cultivated in the island of St. Thomas, and though productive the product is not of high quality. A number of other species are now being tried with the object of affecting improvement in this respect. A fair measure of success has also been obtained with vanilla, and already considerable plantations have been established. Coffee has hitherto been unsuccessful, for the two varieties cultivated, the Kwilu coffee and the Liberian coffee, have not been appreciated on the market, and the more delicate Arabian varieties have not prospered. It is hoped, however, that good results may be obtained by grafting. There are good prospects for the success of coco-nut palms in certain sandy regions not far from the sea.—*Le Mouvement Géographique*, xix. 7.

British Solomon Islands.—The report of the Resident Commissioner of these islands shows that on March 31, 1901, the white population numbered seventy-six, of which fifty were British. The revenue has steadily increased, and last year amounted to £1903, while the exports amounted to £28,260. The chief exports are copra, pearl-shell, ivory nuts, turtle-shell, and bêche-de-mer. Plantations are increasing, and the Commissioner is of opinion that the agricultural progress of the islands would be more rapid if labour recruiting for Queensland were stopped altogether, so that the labour could be utilised locally. He urges the necessity for direct steam communication with Sydney, the port to which the exports are sent, and also for the final settlement of outstanding land claims. Many of the transactions which took place before the establishment of the British Protectorate were of an exceedingly doubtful nature, and until these claims have been settled the progress of the islands will be retarded.—*Times.*

Aërial Railway across the Andes.—M. Abelardo Pizarro has brought before the Government of Chili a proposal to construct an aërial railway for passengers and merchandise between Juncal in Chili (altitude 2234 metres) to Paramillo de las Cuevas in Argentine (altitude 2968 metres). This region of the Cordillera is difficult to cross at all seasons of the year, and in the winter season is impassable on account of the snow. The railway is planned to pass nearly over the track of the Transandin railway. This last on the Chilian side has reached Salto del Soldado, about twenty-five kilometres from Juncal, and on the Argentine side will soon reach Las Cuevas, the point of entrance of the great tunnel, La Cumbie, which is to pierce the summit of the Cordillera. On the Chilian side the distance from Salto del Soldado to the aërial railway at Juncal will be covered in carriages or by means of mules, but on the Argentine side the aërial railway will connect direct with the Transandin railway at Las Cuevas.—*Le Mouvement Géographique*, xix. 11.

NEW BOOKS.

EUROPE.

Great Britain: Handbook for Travellers. By K. Baedeker. With 18 Maps, 39 Plans, and a Panorama. Fifth edition, revised and augmented. London: Dulau and Co. Pp. lxiv + 600. *Price* 10*s*.

Mr. J. F. Muirhead, who is responsible for this volume, has evidently taken great care in its revision for the fifth edition. Perhaps there is no book more difficult to keep up to date than a guidebook, and it is therefore too much to expect even *Baedeker* to be infallible. In Edinburgh there are no longer baths in Nicolson Square, whilst the Corporation Baths that do exist at Stockbridge and Portobello are not mentioned. The maps are scarcely up to Baedeker's usual standard of accuracy and finish, and several new railways are omitted, such as the lines to Fort-Augustus, Lauder, St. Fillans, Westward Ho, etc.

Britain and the British Seas. By H. J. Mackinder, M.A. With Maps and Diagrams. London: William Heinemann, 1902.

This is the first volume of a projected series of twelve, on "The Regions of the World," by well-known writers, under the editorship of Mr. Mackinder. "Each volume will be an essay descriptive of a great natural region, its marked physical features, and the life of its people. . . . In their presentation of facts, the authors will study above all things *perspective*, and will seek to convey right proportion rather than statistical accuracy."

If the promise and performance of this first volume be equalled in the succeeding ones, a notable addition will be made to the best literature of geography; for it may at once be freely said that no better account has ever been given of any region than the account here given of Britain. Throughout, the method is logical, facts being related carefully as cause and effect, and the historical development deduced as a consequence of geological and geographical conditions. Clear and well-reasoned accounts are given of the general world-position of the region, as regards both the ancient world and the modern, of its surface features and their underlying geological structure, of its rivers, of its climatic characteristics, of the successively immigrating races by which it has been peopled, and of their industrial and imperial development. The whole work is instinct with power and thought, the mastery of detail, and the ability to make broad generalisations.

The illustrative maps and diagrams are many and very good; but when it is

said that the references to them in the text involve about 150 turnings of pages, it will be seen that reference to them by page rather than by number would save to the reader much distracting searching. The larger maps, beautiful examples of Bartholomew's orographical work, would have been better, perhaps, on one sheet, and mounted with a throw-out page at the end of the volume.

The book is admirably free from errors in matters of fact, but on page 72 we miss Braeriach, the third highest of British mountains, which, however, duly appears on page 294; on the latter page the Deveron is surely mentioned in error for the Avon; on pages 214 and 215 the maps and the text do not agree about North Isles and South Isles; and on page 351 "America" is wrongly used for "the United States of America." On page 72 some reference might well be made to the earthquakes of Comrie and Crieff. A few press errors may be pointed out:—on page 112 the reference to fig. 63 should be to fig. 64; on page 247 is the mis-spelling "similariteis"; on page 268 the footnote should refer to page 329, not 239; on page 290 "Grame" is probably a misprint for "Graeme." There are too many instances of faulty constructions of the "both . . . and . . ." and "either . . . or . . ." type; and "a series" is several times used as if a plural; "other . . . from" for "other . . . than," on page 73, is inelegant; and "gaps . . . was," on page 102, is worse.

But these blemishes, though they certainly should not occur, and though they jar in so admirable a book, can detract but little from its essential excellence as an example of the high type of work being done at the Oxford School of Geography; and we look forward with high expectations to the completion of the series.

Highways and Byways in the Lake District. By A. G. Bradley. With Illustrations by Joseph Pennell. London: Macmillan and Co., 1901. Pp. 332. *Price* 6*s.*

One of the "Highways and Byways" series, this volume succeeds in interesting the tourist passing through a romantic district in a way to which no mere guide-book could lay claim. A good map shows the extensive character of the author's rambles which extended as far north as the Roman wall, which he unhesitatingly attributes to Hadrian, being apparently unaware of recent controversy.

British Association Handbooks: Fauna, Flora, and Geology of the Clyde Area. Edited by G. F. Scott-Elliot, Malcolm Laurie, and J. Barclay Murdoch.
The Local Industries of Glasgow and the West of Scotland. Edited by Angus M'Lean. Glasgow: Published by the Local Committee of the British Association, 1901.

These very useful and comprehensive handbooks should be noted as possessing much more than a temporary interest. The volume first mentioned, though the records are not complete in all cases, contains a large amount of information, and should prove invaluable to all engaged in working up special groups, living or fossil, in the West of Scotland, or indeed in the Scotch area generally. In *The Local Industries* a very comprehensive account is given of the enterprises upon which the prosperity of Glasgow has been based.

ASIA.

Head-Hunters—Black, White, and Brown. By Alfred C. Haddon, Sc.D., F.R.S. London: Methuen and Co., 1901. Pp. xxii + 426. *Price* 15*s.*

In 1898 the University of Cambridge, with commendable public spirit, organised an expedition to the Murray Islands in the Torres Straits, to British New Guinea, and to Sarawak in Borneo, for the purpose of enlarging our knowledge of

the comparatively unknown races which inhabit these regions. Dr. Haddon was in command, and his colleagues were Dr. Rivers, Dr. Myers, Messrs. MacDougall, Ray, Seligmann, and the late Mr. Wilkin, author of *Among the Berbers of Algeria*. The volume now before us is by Dr. Haddon, and contains a very interesting general account of what the members of the expedition did and saw. The interest is, for the most part, psychological, ethnographical, and anthropological, and we understand that a complete account of the investigations, at least in the Torres Straits Islands, is to appear from the Cambridge University Press, while "the observations made on the mainland in British New Guinea and in Sarawak will be published in various journals as opportunity offers." It was only in Sarawak that Dr. Haddon left the beaten track and penetrated into some of the lesser known parts of Borneo, under the ægis of the local Resident, Mr. Hose, but his account of his journeyings is more taken up with the geology and ethnography of the country than with its geography. Still we have much pleasure in commending this work to our readers as that of a keen, competent, and accurate observer, who sets forth what he has seen in clear and graphic language, and who has enlivened his work with many anecdotes and descriptions from which we can get an excellent idea of the country and of the people among whom he travelled. The book is furnished with many excellent photographs and some useful maps.

The Land of the Blue Gown. By Mrs. Archibald Little. London: T. Fisher Unwin, 1902. Pp. 390. *Price* 21*s*.

Our readers will be very willing to welcome another book on China by Mrs. Little, and in some of the photographs of *The Land of the Blue Gown* they will recognise some of the views with which she illustrated her interesting lecture to us in January last. She writes with the enthusiasm of a wise and sincere friend of the people of China, and, it is needless to add, with the accurate knowledge of an eye-witness and the skilful pen of a ready writer. Her chapters on the anti-foreign riots in Western China, on the little known border tribes, and on the work of missionaries, are particularly interesting and valuable at this time. The book is profusely illustrated with excellent photographs.

The Story of Burma. ("The Story of the Empire" Series.) By E. G. Harmer. London: Horace Marshall and Son. Pp. 211. *Price* 1*s*. 6*d*.

This short and well-written *Story of Burma* will be welcomed by those who do not care to face the standard and voluminous works on the same subject by Phayre, Scott, Forbes, Colquhoun, and Nisbet; but it will miss its point if its readers are not induced to continue their studies of Burma and the Burmese by a perusal of the classical authorities noted above. In the short space at his disposal Mr. Harmer has put together facts—historical and economical—which triumphantly vindicate the Imperial policy of the annexation of Burma. Taking the statistics of Rangoon for an example, we find that, comparing 1881 with 1901, the population rose from 134,176 to 232,326, and the trade, export and import, from 978 lacs to 2436 lacs of rupees. Endowed now with the Pax Britannica, good government, and free trade, the future of the province is assured, and the hopes of the people that one day it will far excel in commercial importance any of the Indian Presidencies do not seem Utopian.

The Hurricanes of the Far East. By Prof. Paul Bergholz, English Translation revised by Dr. Robert H. Scott, F.R.S. Bremen and Shanghai: Max Nössler. English Agents, James Imray and Son, and Norrie and Wilson.

The German edition of this work has already been reviewed here; the English one contains an additional chapter on "Winter storms or Land storms."

AFRICA.

Abyssinia: Through the Lion-land to the Court of the Lion of Judah. By Herbert Vivian, M.A. With 80 Illustrations and 2 Maps. London: C. Arthur Pearson, Ltd., 1901. Pp. 342.

In this volume the author records in a lively way his impressions of a trip from Zaila along the beaten track to Addis Ababa, the capital of Menelik II., and back to the coast as rapidly as possible. In the preface he states his belief that the book will afford a number of people a very welcome opportunity of doing something new and strange, by showing how safe and easy it is to travel in Abyssinia. A perusal of the narrative is, however, calculated to produce quite the contrary effect. It will throw cold water on the ordinary tourist who contemplates a visit in that quarter, and will cause him to postpone his trip to the Greek Kalends. Fully half the volume affords proof that the journey gave rise to incessant annoyance, caused on the one hand by obstinate, insubordinate mule-drivers, by exasperating natives, and on the other hand by the plague of flies, lice, beetles, moths, and great fat caterpillars that invaded his tent and rendered life a burden. There is no compensation in the way of scenery to make amends for this; and the unfortunate tourist will have almost nothing to show on his return home, as there is hardly anything worth buying in the shape of native curios. By the time Mr. Vivian had reached Harrar on his way up country, he was so sick of the worry and monotony of the march, that he fervently hoped Menelik would refuse him permission to proceed further. The difference of tone between the preface and the text is an interesting psychological study, and is evidence how strongly the influence of change of environment and distance reacts upon the mind of a person of sanguine and lively temperament.

On the march to Addis Ababa almost the only striking fact recorded is the spectacle of native dancing of the wildest kind, preluded by a very warlike and realistic exhibition of sword and shield play. It was followed by an entertainment, in which both sexes took part, which leaves the impression that it is a survival of a very ancient Paphian rite. All this is very well and vividly narrated. On reaching his destination the author was granted an audience with the emperor, who is apparently the only Abyssinian for whom he has a good word to say. Captain Harrington's influence with Menelik is partly attributed to the fact that he was the first representative of a Great Power that asked for and wanted nothing. This created a great impression on Menelik, and a revulsion of feeling in favour of Great Britain. The proof of this lies in the fact that the Union Jack is the only foreign flag allowed to fly over any legation at Addis Ababa.

The author believes that, if the French railway from Jibuti into the interior comes to anything, Jibuti will become one of the most prosperous ports in Africa. As a consequence, Zaila, and even Aden, will sink in importance. But this impending misfortune is discounted on another page by the remark that the railway can never be completed unless the company is assisted by the French Government, and even then the shareholders are bound to lose their money. There is not sufficient trade in the country to make an expensively built railway a paying concern, and the trade that now centres at Harrar is gradually being diverted into other channels.

The Fish River Bush, South Africa. By W. T. Black, M.R.C.S. Edinburgh and London: Young J. Pentland, 1901.

This is a reprint of some articles published originally in the *Edinburgh New Philosophical Journal* so long ago as 1853. They describe the topography and

the fauna of the Fish River Valley as they were observed by the author when on patrol with the troops during the Kaffir wars, and give an excellent description of a state of things which, however, has long ago disappeared.

AMERICA.

Die Entdeckungen der Normannen in Amerika. Unter besonderer Berücksichtigung der Kartographischen Darstellungen. Von Jos. Fischer, S.J. Freiburg im Breisgau: Herder, 1902. Pp. 126.

In the course of a learned historical and bibliographical review, the author endeavours to prove the truth of the tradition which, he says, is universal in the North and dates from the eleventh century, "that Eric the Red discovered Greenland in the year 985 or 986 and then colonised it; that his son Leif discovered Vinland (Nova Scotia) in the year 1000, on his return journey from Norway to Greenland, where he was sent by King Olaf to proclaim the Christian faith; that, later, Thorfinn Karlsefni attempted to colonise Vinland, but had to abandon it after an unsuccessful battle; and that, finally, in addition to Vinland, two other lands to the south of Greenland became known by equally adventurous navigation, viz. Markland (Newfoundland) and Helluland (Labrador)." Reproductions are appended of several fifteenth-century maps of Greenland and Europe.

Mexico as I saw it. By Mrs. Alec Tweedie. Illustrated by Photographs by the Author. London: Hurst and Blackett.

Mrs. Tweedie entered Mexico by Eagle Pass and visited near there the large ranche of Mr. Cloete; then Durango, Guadalajara, Tampico, Mexico City, Oaxaca, Vera Cruz, Tehuantepec, etc. She is thus enabled to give us a very fair idea of Mexico. She enjoyed unusual facilities, as she was introduced to the President, and was acquainted with Sir Weetman Pearson, whose firm is so intimately connected with the harbour works at Vera Cruz and the Tehuantepec railway. The author, like most recent travellers, was much struck with the order and civilisation to which Mexico has attained under a stable government. The book gives one a very clear idea of the country and the people, and is most readable, although, in some cases, rather diffuse. It might, without much harm to its general excellence, be compressed into a smaller volume.

Travelling Impressions in, and Notes on, Peru. By Felix Seebee. London: Elliot Stock, 1901. Pp. 196. *Price* 3*s.* 6*d.*

A chatty little book detailing the author's experiences in Peru and among the Andes. He mentions as a curious circumstance that one Christmas Day some Indians appeared dressed in costumes like the mummers or waits of Devonshire.

The Land of the Amazons. Translated from the French of Baron de Santa-Anna Nery, Officier de la Légion d'Honneur, Officier d'Académie, etc., by George Humphery, F.R.G.S. With numerous Illustrations and a Map. London: Sands and Co., 1901. Pp. xlii. + 392. *Price* 16*s. net.*

The first edition of M. Nery's work was published in 1884, and therefore many details in the present issue are new. The descriptions of the country, its products, fauna, and flora are full and instructive, the best and latest authorities on the geology and zoology having been consulted. Some of the author's views as to the future industrial prosperity of the country may be somewhat too highly coloured, for M. Nery is enthusiastic on the subject of the country he describes. At present,

indiarubber and other natural forest products are the chief source of wealth; but the time will come when cultivation must be largely resorted to, and then it will be proved whether Europeans can, as M. Nery affirms, colonise the Amazonas. The climate is fairly healthy, but the heat is often oppressive.

The figures relating to the navigation of the Amazon and its tributaries are probably rather exaggerated. As as instance may be quoted the statement that the Iça or Putumayo is regularly navigated for 935 miles by steamers (p. 44). That it is *navigable* up to the foot of the Andes is certain.

On the whole, however, the book contains a large amount of useful information, and would be an invaluable book of reference if it were provided with an index. It is worthy of a better map.

Sinopsis Estadistica i Jeografica de la Republica de Chile en 1900. Santiago, 1901. Pp. xi + 470.

Reliable statistics of South American States are not easily obtainable, and therefore a work like this, issued by the Officina Central de Estadistica in Santiago, is of great value. Most of the statistics it contains may be accepted without question, such as those relating to means of communication, finance, education, justice, etc. With regard to the population, however, some further information and explanation are desirable. One would like to know, for instance, how far the censuses of 1885 and 1895 were complete, for in many South American States, where the population is scattered and includes large numbers of Indians, the censuses have generally been very imperfect. A striking feature is the great mortality in 1900, 34·5 per thousand as against 28 in 1899. In some years cholera or civil war has raised the death-rate, and the number of deaths has even exceeded the number of births; but neither of these causes operated in 1900. A discussion of the facts which the statistics reveal, and their causes, would have much enhanced the value of the work.

We have received from the *Geological Survey of Canada* a volume on *Altitudes in the Dominion of Canada*, with a relief map of North America. This is the first general compilation of altitudes in Canada, and is exceedingly comprehensive in character.

POLAR.

To the South Polar Regions. By Louis Bernacchi, F.R.G.S. London: Hurst and Blackett, Limited, 1901. *Price* 12*s*.

This interesting volume gives an "account of the cruise of the *Southern Cross* to the South Polar Seas, 1898-1900, and of the first winter ever spent on Antarctic shores." It is from the pen of Mr. Bernacchi (an Australian, notwithstanding his Italian name), who was the astronomer and physicist of the expedition and commander-designate in case of any unfortunate accident to Mr. Borchgrevink, and it is intended for the lay reader rather than for men of science and experts. Apparently the expedition suffered most from terrific gales, which lasted often for twenty-four hours at a time, and very seriously impeded the work for which it was intended, but, notwithstanding this, a great amount of information and experience was acquired which cannot fail to be of immense use in future expeditions. Probably the outstanding lesson from Mr. Borchgrevink's expedition is that in future attempts to reach the South Pole some spot other than Cape Adare must be selected as the base of operations. Mr. Bernacchi makes the story of the long Antarctic winter as interesting and as varied as could be expected, and his book is equipped with excellent illustrations and good maps.

GENERAL.

Aus den Tiefen des Weltmeeres. Schilderungen von der Deutschen Tiefsee-Expedition. Von Carl Chun. Mit 6 Chromolithographieen, 8 Heliogravüren, 32 als Tafeln gedruckten Vollbildern, 2 Karten und 390 Abbildungen im Text. Jena: Gustav Fischer, 1900. Pp. viii + 550. Size, 11 × 8.

The oceanographical work of the *Valdivia* Expedition has already been noticed at some length in this Magazine, and on the return of the Expedition the Society's medal was awarded last year to its distinguished director, Professor Chun, and also to Captain Kreck of the *Valdivia*, for their important contributions to geographical science. It is therefore unnecessary to give a further account of the Expedition; suffice it to say that Professor Chun's book is a worthy record of a very interesting voyage. It is a most attractive volume, and in the great wealth of splendid illustrations is almost unique. The first part of the work deals with the outfit and equipment of the Expedition; then follows a narrative of the cruise, with descriptions of the places visited; lastly comes an account of the collections of deep-sea fauna. In Germany the work should do much to stimulate and popularise the interest in deep-sea research.

Die Hochgebirge der Erde. Von Robert von Lendenfeld. Freiburg: Herder.

This handsome volume, with 496 pages, a copious index, and glossary of geological terms, 15 maps, and 149 beautifully executed illustrations of mountain scenery in every explored region, must be welcome to all lovers of the high places of the earth whose acquaintance with the language of the author is sufficient to enable them to appreciate the value of the text. The work begins with a short general account of the internal structure of mountains and their geological characteristics—folding, faulting, and volcanic phenomena. The external and meteorological agencies affecting the form and physiognomy of mountains are next treated of. These include changes of temperature, chemical action, circulation and effect of wind and water, snow, avalanches, glaciers, landslips, river erosion, etc. A third section is devoted to the general form and distribution of mountain ranges, and a fourth to the flora, fauna, and human inhabitants of high lands, and of the Swiss Alps in particular. The second or special part is devoted to a description of high ranges or individual peaks in every explored part of the earth from the Alps to the Caucasus and Himalayas, and from the New Zealand Alps and Rocky Mountains to the isolated volcanic peaks of the Antarctic continent and South America. The illustrations are, as a general rule, particularly excellent, and the full index of 33 pages further enhances the value of this most attractive work. We notice that, although the volume has just reached us, it is dated 1899.

From the agents of the *American and Australian Line, Santa Fe Route* we have received a copiously illustrated little handbook, entitled *Pacific Tours and Round the World*, which, as the name indicates, gives a descriptive account of a tour round the world. It is pleasantly written, and includes a large amount of information useful to the intending traveller.

Cecil Rhodes. by Howard Hensman. Edinburgh and London: William Blackwood and Sons, 1901. Pp. ix + 382. *Price* 12*s.* 6*d.* net.

In his preface to this work, Mr. Hensman claims that he has made it his constant endeavour to hold the scales of justice evenly; but the reader will not have

perused many pages ere he is aware that Mr. Hensman has been completely fascinated by the personality and genius of his hero. And of this he has no reason to be ashamed. Cecil Rhodes was a builder of the Empire second to none of living men, and the story of his career is one of which every true Englishman is justly proud. In the volume now before us the story of his life is brought down only to the end of the siege of Kimberley, and Mr. Hensman is entitled to the credit he claims of having omitted nothing that is essential, and included nothing that is superfluous. There are passages in Mr. Rhodes's life, *e.g.* the share he had in the preparations for the notorious Jameson raid, and his conduct to the military authorities during the siege of Kimberley, regarding which there is, and we presume ever will be, a conflict of opinion; but even his bitterest enemies will hardly deny his indomitable courage, his fertility of resource, his statesmanlike genius, his eager patriotism, his consummate knowledge of Africa, his financial ability, his personal attraction, and in general his brilliant success, all of which taken together have raised him to the foremost place of colonial statesmen. All Englishmen must sincerely regret that he has not been spared to continue and complete the magnificent though arduous task to which he had put his hand.

A Treatise on Surveying, comprising the Theory and the Practice. By William M. Gillespie, LL.D., formerly Professor of Civil Engineering in Union College. Revised and enlarged by Cady Staley, Ph.D., President of Case School of Applied Science. London: Hirschfeld Bros., 1901. 2 vols. Pp. 428+127 and 467.

Professor Gillespie's *Land Surveying*, first printed in 1855, has been the standard work on the subject in the United States. Another volume on *Levelling and Higher Surveying* was left unfinished at the time of the author's death, and was completed by Dr. Staley in 1870. The two works were revised and published in one volume in 1887, and now Dr. Staley finds that the requirements of the advanced students in technical colleges demand a fuller treatment of triangulation, field astronomy, the more precise methods of levelling, etc.

The first part describes the operations of ordinary land-surveying and direct levelling and the instruments employed. Full directions are given how to adjust the instruments and to determine their errors, how the land should be parcelled out for measurement, and how its area can be calculated from the measurements taken. After chain-surveying, angular surveying with the compass and transit, and levelling with various instruments and appliances, are treated in great detail, and the student is directed how to proceed when the nature of the ground puts difficulties in his way.

The chapters of the second part are mostly contributed by specialists—Mr. D. B. French of the United States Coast and Geodetic Survey, Mr. E. P. Dickey, a mining engineer, and others. A very good outline of the methods of triangulation, base-line measurements, determination of latitudes and longitudes, etc., is given by Mr. French, including, of course, descriptions of the duplex base apparatus constructed by the Coast and Geodetic Survey, and the particular form of plane-table adopted by the United States Geological Survey. A short sketch of photographic surveying might have been expected. Probably, however, a reference to the United States Coast and Geodetic Survey Report of 1893 has been considered sufficient, because this form of surveying is little used in the United States.

The two volumes form an excellent handbook of the art of mapmaking from the first elementary measurements to the finished map with its contours, hachures, and conventional signs. The illustrations are very numerous, and materially assist the reader in understanding the text.

History of Geology and Palæontology to the end of the nineteenth century. By Professor Karl Alfred Von Zittel. Translated from the German by Maria M. Ogilvie-Gordon. London: Walter Scott, 1901. Pp. 562. 13 Portraits. *Price* 6*s.*

A work of this class could not have fallen into better hands than those of Dr. von Zittel, the eminent and accomplished professor of Geology and Palæontology in Munich, whose extensive travels and wide experience have freed him from the danger of taking too German a view of the history of his own science and its founders. The translator, Mrs. Maria M. Ogilvie-Gordon, who is an old and distinguished pupil of Dr. von Zittel, states in a prefatory note that the text of the original has been somewhat curtailed in order to secure uniformity with the volumes of the "Contemporary Science" Series, of which this is one. The average reader will however find in the 562 closely printed pages an adequate summary of the work of geologists in many different countries, from the earliest period down to the end of the nineteenth century. Full justice has been done to the memory of James Hutton, the founder of the Scottish or Uniformitarian School whose final triumph over the Neptunists or followers of the Wernerian School took place about seventy years ago, and was a matter of the keenest interest among the Edinburgh Society of the period. In spite of the overthrow of the Neptunists by the Plutonists or Huttonians the evil consequences of Werner's teaching retarded the progress of true geological research in Germany for a couple of generations, and the most brilliant generalisations and researches were made in other countries by the disciples of the Uniformitarian School of which Sir Charles Lyell was the chief and brightest exponent in the middle third of last century.

The author, with Teutonic thoroughness and care, has spared no pains to complete his subject and bring it up to date, a work involving an enormous quantity of laborious investigation among the network of branches into which specialists have succeeded in splitting up the science within the last decade or two. As a book of reference and an interesting though necessarily condensed summary of studies extending over and beneath the whole surface of the earth, this work will be welcomed by all students of geology, and Professor von Zittel is to be congratulated on the English translation, which will greatly enlarge the circle of those who will receive benefit from the fruits of his laborious task.

BOOKS RECEIVED.

We have received the following new books, which will be reviewed in due course:—

The Alps in 1864. A Private Journal by A. W. Moore. Edited by Alex. B. W. Kennedy. Edinburgh: Douglas, 1902. Pp. xxxv + 444. *Price* 36*s.*

Siam in the XIXth Century. By J. G. D. Campbell. London: Edward Arnold, 1902. Demy 8vo. Pp. x + 332. *Price* 16*s.*

Swiss Life in Town and Country. By Alfred Thomas Story. London: George Newnes, 1902. Crown 8vo. Pp. 248. *Price* 3*s.* 6*d.*

German Life in Town and Country. By W. H. Dawson. London: George Newnes, 1901. Crown 8vo. Pp. 271. *Price* 3*s.* 6*d.*

French Life in Town and Country. By Hannah Lynch. London: George Newnes, 1901. Crown 8vo. Pp. 261. *Price* 3*s.* 6*d.*

Illustrated Guide Books. Ward, Lock and Co., London. *Inverness. Oban, Fort William and the Western Highlands. Aberdeen, Deeside, Donside, etc. Price* 1*s. each.*

Grammatik der Sanskrit-Sprache. 2 Auflage. By Dr. Richard Fick. Wien, Pest, Leipzig, Hartleben. Pp. xii + 183. *Price* 2 *marks.*

African Wastes Reclaimed. Illustrated in the Story of the Lovedale Mission. By Robert Young. London: Dent and Co., 1902. Pp. x + 268. *Price* 4*s.* 6*d.*

Savage Island. By Basil Thomson. London: Murray, 1902. Demy 8vo. Pp. viii + 234. *Price* 7*s.* 6*d.*

East of the Barrier, or Sidelights on the Manchuria Mission. By the Rev. J. Millar Graham. Edinburgh and London: Oliphant, Anderson and Ferrier, 1902. Crown 8vo. Pp. vi + 237. *Price* 3*s.* 6*d.*

The Path to Rome. By H. Belloc. London: George Allen, 1902. Crown 8vo. Pp. xv + 448. *Price* 7*s.* 6*d.*

Also the following Reports, Annuals, etc.:—

Transactions of the Highland and Agricultural Society of Scotland. Vol. xiv. Edinburgh: 1902.

Report of the British Association for the Advancement of Science, 1901, *Glasgow.* London: Murray, 1902.

Bombay Gazetteer. Vol. ix. Part i. Bombay: Printed at the Government Central Press, 1901.

First Report of the Geological Survey of Natal and Zululand. Pietermaritzburg: Davis and Sons, 1901.

Annual Reports of the Geological Commission, Cape of Good Hope, 1898 *and* 1899. Cape Town: Richard and Sons, 1900.

Report of the Administration of Coorg for the Year 1900-1901. Bangalore: Mysore Residency Press, 1901.

Anuario Hidrografico de la Marina de Chile. Tomo 23. Valparaiso: Talleres tipográficos de la Armada, 1901.

Papers and Reports relating to Minerals and Mining. Wellington, New Zealand: John Mackay, 1901.

Report on the Administration of the Province of Assam for the year 1900-1901. Shillong: Assam Secretarial Printing Office, 1901.

British Guiana Blue Book, 1900-1901. Demerara: C. K. Jardine, 1901.

Bureau of American Ethnology. 18th Report. *Indian Land Cessions in the United States.* Washington: Government Printing Office, 1899.

Report on the Administration of the Punjab and its Dependencies for 1900-1901. Lahore: Punjab Government Press, 1902.

Report on the Administration of Burma during 1900-1901. Rangoon: Government Printing Office, 1902.

Report on the Administration of the Bombay Presidency for the Year 1900-1901. Bombay: Government Central Press, 1902.

Publishers forwarding books for review will greatly oblige by marking the price *in clear figures, especially in the case of foreign books.*

NEW MAPS.

EUROPE.

ORDNANCE SURVEY OF SCOTLAND.—Scale 4 miles to 1 inch. Sheet 3. *Orkney Islands.* Reduced from the One-inch Map. Revised in 1895, and published by Col. D. A. Johnstone, R.E., 1902. *Price* 1*s.*

Ordnance Survey Office, Southampton.

This is a new coloured issue of the quarter-inch map. The hills are printed in

brown, roads in orange, and water shaded in blue. It is well designed, clearly drawn, effectively printed, and as a piece of cartography represents a decided improvement on the previous sheets issued.

ORDNANCE SURVEY OF SCOTLAND.—The following publications were issued from 1st to 31st March 1902 :—Parish Maps (Scale 1 : 2500, Revised, with Houses ruled, and with areas. Price 3s. each). *Aberdeenshire.*—Sheets VIII. 8 ; IX. 13 ; XIV. 9, 13 ; XVI. 3, 4, 8, 9, 10, 13, 14, 15, 16 ; XVII. 1, 2, 5, 9, 11, 14 ; XVIIA. 13 ; LI. 10, 11, 15, 16 ; LXI. 1, 2, 3, 4, 5, 6, 7, 8, 9, 11, 15, 16 ; LXX. 2 ; LXXXI. 2, 6. *Forfarshire.*—Sheet XLVIII. 2. *Orkney.*—Sheets LXXXIX. 8, 10, 11, 12 ; XC. 4.

Note.—There is no coloured edition of these Sheets, and the unrevised impressions are withdrawn from sale.

Six-inch Maps (Quarter Sheets—Revised). *Perthshire.*—33 NE. (Price 1s.) With contours, Price 1s. each. *Aberdeenshire.*—43 SW. ; 48 SW. *Perthshire.*—53 SE. ; 98 NW. ; 110 SW.

Six-inch County Maps, Revised. *Aberdeenshire.*—Sheets (67 and 58) 76, 78 (Engraved). Price 2s. each.

Four-mile Maps (by Sheets, fully coloured). Sheets 1, 2, 3, 4, 5, 6 ; Price 1s. each.

Catalogue of the Ordnance Survey Publications, revised and corrected to the 1st January 1901. A new edition is in progress in two parts, viz. :—one for the one-inch and smaller scales and miscellaneous maps of the United Kingdom, and one for the larger scale maps of Scotland.

YORK AND SCARBOROUGH. Bartholomew's Reduced Ordnance Survey. Sheet 7. Scale 2 miles to an inch. With roads specially revised by the Cyclists' Touring Club. *Price* 1*s. Mounted on cloth* 2*s. net.*

John Bartholomew and Co., Edinburgh.

This new sheet includes the rocky coast from Whitby to Scarborough, and southwards to the sands of Filey, Bridlington, and Hornsea. The country of the Moors and the Wolds is shown in telling relief by the effective contour colouring.

LEEDS, BRADFORD, AND YORK. Bartholomew's Cyclists' Road Map. Scale half an inch to a mile. *Mounted on cloth,* 1*s.* 6*d. net.*

John Bartholomew and Co., Edinburgh.

A useful road map of Southern Yorkshire, embracing an area of about 100 miles from west to east, and 60 miles from north to south. There is no colouring on the map except the cycling roads.

AFRICA.

EGYPTIAN SUDAN. War Office Map of Africa. Scale 1 : 250,000, or about four miles to an inch. 1902. District Sheets—Akobo, Musha. Reproduced from Maps supplied by the Director of Sudan Surveys. *Price* 1*s.* 6*d. each.*

Intelligence Division War Office.

NIGERIA. War Office Map of Africa. Scale 1 : 1,000,000, or about sixteen miles to an inch. 1902. *District Sheet*—Nikki. *Price* 2*s.*

This is the first published sheet of a new War Office Map of Africa on the scale of 1 : 1,000,000. According to the index map, the whole continent will be completed on this scale in 132 sheets. The map is a clearly drawn reduction from the 250,000 scale, and for all general purposes ought to prove most useful.

AMERICA.

UNITED STATES. Rand, M'Nally and Co.'s Indexed County and Township Pocket Maps—Georgia, Idaho, Illinois, Indiana, Indian and Oklahoma Territories, also Hawaiian Islands. 1901. *Price 25 cents each.*

Rand, M'Nally & Co., Chicago and New York.

With the exception of the Hawaiian Islands, which appears to be a new map reduced from the Admiralty Chart, the above are new editions of Messrs. Rand, M'Nally's popular state maps. Although not finished examples of cartographic art, they possess many useful features for business purposes, notably, locating the branch or particular division of railroad upon which each station is situated, and the nearest mailing point of all local places. The complete index incorporates the 1900 census.

NEW ATLASES.

STIELER'S HAND-ATLAS. Neue, neunte Lieferungs-Ausgabe von ——. 100 Karten in Kupferstich in 50 Lieferungen. Lieferung 4. Nr. 81, Südsee-Inseln. Nr. 93, West Indien. Lieferung 5. Nr. 62, Inner Asien. Nr. 78, Australien, Bl. 2. *Price 60 pfennig per part.*

Justus Perthes, Gotha.

The above maps are all new plates exhibiting the same high standard of work as those already noticed. We might add, however, that, considering the effectiveness of the subject, the treatment of the relief of *Inner Asia* scarcely seems so skilfully dealt with as in the map of China on the same scale.

THE TWENTIETH CENTURY CITIZEN'S ATLAS, containing 156 pages of Maps and Plans, with an Index, a Gazetteer, and Geographical Statistics. Edited by J. G. Bartholomew. In 26 parts. Parts 13, 14, 15, 16. *Price 6d. each.*

George Newnes, Limited, London.

In these recent parts the leading characteristics of this atlas in completeness and clearness are fully maintained. There is also every evidence of careful revision to date.

DIAGRAMS.

PANORAMA VON ALEXANDRETTE. 1901. *Prag: Verlag von H. Mercy Sohn.*

This is an effective panorama of the Bay of Alexandretta viewed from the sea. It is about nine feet long, and is supplemented by a map of the environs of Alexandretta and a chart of the Gulf of Iskanderun. Printed on the back is descriptive and statistical text.

MERCHANT SHIPPING. Grafisk Fremstilling af de forskjellige Landes Handelsflaader. 1850, 1880, 1899.

Christiania: Statistiske Centralbureau.

This is an interesting diagram showing the comparative tonnage of the various merchant navies in steam and sailing vessels, grouped according to their flags at different periods. At 1850, about the time when steamships came into general use, the total shipping makes a very small show compared with the great fleets of the present day. About 1880, sailing vessels had perhaps reached their maximum development, but in 1900 they are far behind the steamers, and also show a considerable falling off as compared with 1880. The British lead in shipping as shown in these graphic statistics is most imposing.

THE SCOTTISH GEOGRAPHICAL MAGAZINE.

THE PHYSIOGRAPHY OF EDINBURGH.[1]

A View from Arthur's Seat.

(With Map.)

By RALPH RICHARDSON, F.R.S.E., F.S.A. Scot. (Hon. Sec. R.S.G.S.)

THE term *Physiography* (literally "a description of Nature") was first applied by Professor Huxley to the subject of a series of lectures which he delivered to a general audience, "not on any particular branch of natural knowledge, but on natural phenomena in general." He states that he "wished to draw a clear line of demarcation, both as to matter and method, between it and what is commonly understood by *Physical Geography*." He endeavoured to give his audience, "in very broad but accurate outlines, a view of the *place in Nature* of a particular district of England—the basin of the Thames."

I shall venture to offer in very broad outlines and in very popular language—avoiding technical terms if I possibly can do so—a view of the *place in Nature* occupied by our

"own romantic town";

but, in justice to those whose names I venerate just as much as I do that of Huxley, I must state that there have been no exponents of the leading principles of the science of *Physiography*, as defined by him, more lucid, more eloquent, or more eminent than the founders of our own SCOTTISH SCHOOL OF GEOLOGY.

1. THE SCOTTISH SCHOOL OF GEOLOGY.

Whilst the great English geologists applied themselves particularly to the study of Rock-strata and the fossils which the rocks contained,

[1] Being a Lecture delivered, by request, in the Nelson Halls of Edinburgh Public Library, at Fountainbridge and Stockbridge, 19th and 21st February 1902.

the special characteristic of the Scottish School of Geology has been its devotion to the elucidation of the physical side of Geology. In this study of the Physiography of the globe Scottish geologists have stood conspicuous. Hutton, Playfair, Macculloch, Lyell, Murchison, Hugh Miller, Ramsay, Archibald and James Geikie, and others have raised this particular branch to the highest fame and dignity; have written upon it in language which is prized as classic and is known all over the English-speaking world; and have impressed by this means upon the public mind a knowledge of the fact that Geology is no mere dry-as-dust study of ancient rocks and ancient life-forms, but that it is a living interpreter of the world we inhabit, with all its natural beauties and wonders. These talented writers have cast a flood of light upon the last geological epoch—that epoch which is the most interesting to the general public, because it is the epoch during which Man made his appearance, and the world gradually assumed the form in which we find it to-day.

Why have Scottish geologists been so identified with this, the physical side of geology? I can only account for it by adducing the *genius loci*. The Scottish geologist does not, in his geological expeditions, find himself, as his English brother of the hammer too often does, standing in the midst of flat fields with a lazy stream meandering in a deep-cut channel through a country whose rocks belong to the later formations. On the contrary, the Scottish field-geologist—and all true Scottish geologists are field geologists—oftener finds himself standing on the mountain's brow surveying a strangely grand geological scene. The rocks around him are among the first created. Every modern rock has been removed from them, if it ever existed, by denudation. The rivers at his feet flow with the rapidity of mountain torrents. The lakes around him often occupy hollows scooped out by vast icesheets. He finds sand high up upon the mountains and all over their slopes. He thus obtains evidence of great movements which have taken place within recent times upon those ancient rocks which represent almost a previous eternity.

All these influences, acting upon his mind, turn its attention to the physical side of Geology. He begins to take an interest in the varied and often beautiful scene he sees around him, and not merely to admire its beauties, but to attempt to discover the agencies by which it acquired its present form. What shaped those mountains? What formed those terraces? How is sand strewed at such lofty elevations? Why are those rocks polished and striated? What placed that strange, far-travelled boulder on the very top of that hill? Why are Arctic shells found sometimes 500 feet above the nearest seashore?

In other words, every scene around him provokes its "Why" and "Wherefore," and his time is fully occupied in attempting to answer them, whilst health and vigour are imparted by the surveys he gladly undertakes. Contrast with this field geologist, so characteristic of the Scottish School, the student of fossils or minerals patiently studying at home, with the aid of lens and microscope, the internal secrets of the rocks, and you will, I think, admit that, although it is only one of the

provinces of Geology, we Scots have selected the most pleasing, the most healthful, and the most attractive. It is our side, too, that of Physiography, or the scientific study of Scenery, which has redeemed Geology from being styled, as the ignorant often call it, a dull and dead and dry science, for we have all lovers of Scenery upon our side, and these include every one worth the knowing.

2. Arthur's Seat.

In the true spirit, then, of our race, let us climb Arthur's Seat, and note the leading features of the physiography of Edinburgh. As we approach the hill, we remark its leonine configuration, which is due to the weathering it has received, and to the harder and softer rocks of which Arthur's Seat is composed, resisting or yielding to that weathering. Little does the average climber imagine the extraordinary character and assemblage of rocks comprised in Arthur's Seat. Looking at it from its southern side extending SW. and NE., we find, beginning at the SW., a series of sandstones and shales divided and penetrated by igneous rocks, such as the "Salisbury Crags," the "Echoing Rock," and "Samson's Ribs." Further east we come upon a mass of agglomerate, followed by one of porphyry forming the *Lion's nose*; a rounded mass of tuff, forming his noble *brow*. Then we observe the summit of the hill, and find that it forms the apex of a vast column of Basalt, one of the hardest of rocks, and which, like a huge stake driven into the ground, has defied denudation, and kept the whole assemblage of rocks together. Further east we find more tuff, a volcanic product, consisting of ash and pebbles blown out of the volcano which was once active here. The result of the softness of this tuff has been the production of the gracefully sloping *neck of the Lion*, whilst a series of Basalts and Amygdaloids further east have, owing to their hardness, resisted the weathering, and now form the *back or haunches* of the colossal Lion which guards the eastern approach to the Scottish metropolis.

Having gained the summit of the hill, let us look around upon the magnificent panorama which extends before us, perhaps the most splendid conjunction of hill, rock, city, and sea which Earth presents.

3. Raised Beaches.

I cannot help thinking that the first direction in which any one will look on attaining the summit of Arthur's Seat, and the first view he will enjoy, will be the view of the sea—the most glorious object in Nature. Let us, then, in considering the Physiography of Edinburgh, work from the coast inland, and begin with the sea-line.

Geologically, it is a very remarkable sea-coast, that which borders our familiar Firth of Forth. It attests several upward movements of the earth's crust here ere it settled down to become the scene of the history of our Scottish people.

A raised beach, some 25 to 30 feet above the present mean tide-

mark, skirts the entire shore-line. Musselburgh and Fisherrow are built upon it. So also is a considerable portion of Portobello. Leith Links and a large part of Leith stand upon it. Dalmeny House is situated upon the same raised beach, which indicates the old sea margin, now elevated considerably above flood-mark.

An older and still more remarkable raised beach occurs further inland. The Battle of Pinkie was fought upon or near it in 1547 : the Battle of Prestonpans in 1745. It curves round behind Musselburgh and Portobello, and then passes through Edinburgh by Piershill, Abbeyhill, London Street, Royal Circus, the Dean Bridge, and Fettes College, continuing north-westwards behind Granton and Muirhouse. This raised beach is 100 feet above the level of the sea which once covered the land now occupied by Musselburgh, Portobello, Leith, and a large portion of the north side of Edinburgh.

4. Leading Contours.

There is a gradual ascent of 300 feet and upwards from the sea-level at Leith to the higher portions of Edinburgh, such as the districts of Morningside, Merchiston, and Greenhill. My friend, Mr. J. G. Bartholomew, has kindly allowed me to see in manuscript an "Orographical" (or height-showing) map of Edinburgh, which he specially prepared some time ago, and which, besides others, exhibits the leading contours in the ascent from the level of the sea to the summit of the Castle, a distance of about $2\frac{1}{2}$ miles. From the sea at Leith to the junction of Balfour Street and Leith Walk marks a rise of 50 feet. Proceeding up Leith Walk to Haddington Place, we ascend another 50 feet. At the foot of Leith Street we have ascended 200 feet above the sea, and when we reach Princes Street we find its level to be 219 feet at the east end and 207 feet at the west end—for Princes Street is not level, as many suppose. We have to climb 130 feet above Princes Street ere we reach the Castle Esplanade (350 feet), and if we ascend to the highest point in the Castle we shall be 441 feet above the sea.

5. Denudation.

From a commanding height like that of Arthur's Seat (822 feet above the sea) we note a certain regularity and undulation in the general surface of the country around Edinburgh and on which the city is built. This is the result of the underlying rocks, consisting mainly of sandstones and shales, having been ground down by the passage over them, or by the action, of great denuding or eroding agencies in the past. The rocks here are very old, and belong to the Carboniferous period. The denudation of ages has passed over them, and has left them but the wreck of what they once were. They have been as thoroughly planed in surface and reduced in bulk as a piece of wood by a turning-lathe. Let us try and discover some of the agents which have imparted to them their present appearance.

As the volcanic rocks of Edinburgh were forced through the sandstones which once covered them by igneous agencies, and as the former

stand at present hundreds of feet above the latter, we can form a slight idea of the enormous removal of strata which denudation has occasioned in this district. Of the precise nature of that denudation we cannot be certain, as it occurred during distant geological ages, but of the more recent methods of denudation we have some knowledge, and I shall instance what our rocks have been subjected to during a period dating from at least the Glacial epoch to the present day.

6. Glacial Action.

The Glacial epoch began shortly before the appearance of Man, and continued after his advent, so we have at last some human chronology, however faint or distant, to give human interest to the picture. During this epoch the most intense cold prevailed, and the climate of Greenland was general over all Scotland. We had likewise all the Greenland concomitants at work—icebergs, glaciers, and that vast moving sheet of inland ice which covers Greenland to-day. And remark this, that all these glacial agencies were *active*—the Icebergs floating and depositing boulders, sand, and gravel—the Glaciers descending and forming moraines—the Icesheet moving and grinding the face of the rocks, and striating nearly every pebble it crushed, and producing that till or boulder clay which is found all over Midlothian, and is a tumultuous, unstratified substance, full of rounded, polished, scored, and travelled rocks and pebbles, some of the latter as finely striated as if by a diamond. Truly,

> "The mills of God grind slowly,
> But they grind exceeding small."

It is clear that, given these tremendous glacial engines moving over a district like ours for an enormous space of time, and the entire rock surface would be smoothened and worn down or covered with a deposit of boulder clay which is sometimes from 50 to 100 feet deep.

That is the modern and now accepted theory of the cause of the planing and polishing of rocks in the Edinburgh district, but it was not the theory advanced by several eminent old Edinburgh geologists. They thought that vast deluges had occurred, and that great streams of water had swept over the country and had given it its present undulating contour. It was the visit of the celebrated Swiss geologist Agassiz to Edinburgh in 1840 which led to our obtaining the key to the more recent denudation of rocks in Scotland. The guest of another great geologist, Charles Maclaren (Editor of *The Scotsman*), Agassiz visited with him several places in and around Edinburgh, and pronounced them to display the same evidences of ice-action which he knew so well in his native Alps. He reasoned, after the manner of our illustrious fellow-citizen James Hutton (the founder of the Scottish School of Geology), from the Known to the Unknown, and deciphered a riddle which had long puzzled local geologists.

One of these had been the celebrated Sir James Hall of Dunglass, one of the most famous of Scottish geologists. Sir James lived before Agassiz had promulgated his glacial theory, yet he went to Switzerland

to see whether the rocks there bore any resemblance to those of Corstorphine Hill and could throw any light upon the grooved, smoothened, and striated surfaces which the latter often present.

By a strange irony of fate this highly gifted man, standing with the whole glacial battery of the Alps displayed before him, remained blind to its teaching and power. He actually returned to Edinburgh after witnessing the glaciation of Switzerland, and in an elaborate paper read before our Royal Society, of which he was President, he gravely announced that the planed, grooved, and striated rocks of Corstorphine Hill were produced by great *debâcles* or torrents of water.

I remember when walking through the Hasli Thal in Switzerland, on my way from Meyringen to The Grimsel, being particularly struck with what are there called *roches moutonnées* (literally "sheep-backed rocks"). These long, smooth, rounded, striated rocks occur there in great profusion. I made sketches of several, and when I returned to Edinburgh I visited Corstorphine Hill to see whether there were any instances of *roches moutonnées* there also. I had no difficulty in recognising them, and I concluded, as all modern geologists have done, from these and other evidences, that that hill, like the entire neighbourhood of Edinburgh, had once been under the influence of a glacial epoch such as still exists on a small and shrunken scale in Switzerland and on a much greater scale in Greenland.

7. Action of Frost.

I have instanced the action of Ice during the glacial epoch as helping to give the rocks around Edinburgh their present planed and mammilated form. But the action of Frost may at any time rend the hardest rock. The rock on which Edinburgh Castle stands is a particularly hard igneous rock, yet nearly every year the War Office employs men to remove the blocks and fragments which have been split off it by the action of Frost. Having frequently noticed the immense quantity of *débris* split by Frost from the Castle Rock during a single winter and collected in Johnston Terrace, I shall now state the reason for so large an amount of rock being displaced, and give you some statistics on the subject which have not been hitherto published.

The Basalt of which the Castle Rock is composed is excessively hard, but it is also jointed, and, during winter, Water filters into the joints and becomes frozen. The expansion caused by the conversion of the Water into ice bursts portions of the Basalt asunder, and, when a thaw comes, a heap of fragments marks where Frost, the quarryman, has been at work. As this process has been going on ever since the Castle Rock was exposed to the atmosphere, we can dimly imagine the enormous loss of rock to which the mass has been subjected. The area of the Rock presently exposed to the atmosphere measures about 700 feet by 800 feet with an elevation of 200 feet. I have ascertained from the Contractor employed by the War Office that, on an average, he annually removes 45 tons split off the Castle Rock during winter. So that even since the comparatively recent time when Prince Charlie appeared before the Castle in 1745 and vainly summoned it to surrender, the Rock has been

reduced in size by no less that 7065 tons. It will take, however, on the above calculation, more than 150,000 years before the action of Frost can remove the Castle Rock altogether.

8. Action of Wind.

Another agent of what is called "sub-aërial" denudation is furnished by the proverbially frequent and powerful *Winds* of Edinburgh. Personally, I do not know a more wind-swept city. This, of course, has its advantages in freeing it from fogs (the curse of London), in promoting sanitation, and in rapidly drying the streets after rain. At the same time very high winds have their drawbacks, and I have always desired to ascertain the scientific reason why they should be so prevalent in Edinburgh. I refer, of course, to our most frequent and most powerful winds, those from the west, which have caused so many of our tall chimneys and trees to lean towards the east. On an average, the strong south-west wind blows over the Edinburgh district during 119 days of the year. These tremendous winds have doubtless played for ages upon the rocks of the district and must have eroded them to a considerable extent. The position of our city—situated, as it is, generally 200 to 300 feet above the sea—at the end of a funnel which extends from the Atlantic by the Firth of Clyde to the Firth of Forth, whilst the comparatively level country traversed by the funnel does not break the force of the wind or shelter the city, forms, I venture to think, the reason why Edinburgh is so exposed to these great winds from the west. The elevation of the land following a straight line drawn from Greenock to Leith never exceeds 500 feet above the sea-level. It may be remarked, as a curious coincidence, that all the great denuding agencies which have affected the Edinburgh district—the preglacial, the glacial, and the prevalent winds—have come from the west and passed over it to the east.

Anecdotes of the force with which Edinburgh winds sometimes blow are not wanting. The first Editor of the *Edinburgh Review*, Sydney Smith, told how he rescued an Edinburgh citizen whom he found lying, blue in the face and helpless, having been blown by the wind against the door of Smith's house in George Street.

Writing in 1779, Hugo Arnot states in his *History of Edinburgh* (p. 319) that "the New Town is in a special manner exposed to very violent winds which rage in Edinburgh with incredible fury. Houses blown down, large trees torn up by the roots, people carried off their feet and beat down upon the pavement, are no uncommon circumstances in Edinburgh. It will hardly be credited," he adds, "that on Saturday the 3rd of January 1778, the Leith Guard, consisting of a sergeant and twelve men of the 70th Regiment, were all of them blown off the Castle Hill, and some of them sorely hurt."

An athletic country friend of my own told me that, arriving one night in Edinburgh, the wind suddenly carried him off his feet in Princes Street. His hat went in one direction, his spectacles in another, his bag in a third, and he had only time to clutch a lamp-post to save himself from being whirled into space.

9. Edinburgh Hurricanes.

I can myself bear testimony to the violence of one hurricane, that of 24th January 1868, the details of which have been recorded in Dr. Buchan's *Handy Book of Meteorology* (p. 261), and in an article in *Good Words* by the father of Robert Louis Stevenson, Mr. Thomas Stevenson, C.E., President of the Royal Society of Edinburgh. I was then a W.S. apprentice in an office in South Castle Street, and never shall I forget the scenes I witnessed from its windows, for office-work and all business was at a standstill. Indeed, our junior partner (Mr. J. F. Rodger) was kept a close prisoner all day in Edmonston and Douglas's bookshop in Princes Street. The scene in South Castle Street was like the pandemonium occasionally enacted in the pantomime at the theatre when everything is set flying about at once. The wind tore the iron tops off the lamps and sent them hurtling through the air to the danger of any one daring enough to be in the street. Boys with fish trays had them swept off their heads and their contents scattered in every direction. Cabs were overturned. Cupolas were blown off. Slates descended in showers. Churches and houses were seriously damaged, and one house fell with a crash, killing its inmates and burying them in its ruins.

Dr. Buchan, who happened to be on that particular day at the Royal Observatory on the Calton Hill, says that between 2 and 3 P.M. the gravel on the platform facing the south was being blown off and about like hailstones in a shower of hail. Next morning every loose stone (several of them weighing 2 oz.) had been swept off this platform by the wind—a circumstance which is not known to have occurred before at the Observatory. Many cabs were blown down with their horses; in one case, the horse had somehow got disentangled from the tracings and was seen standing quietly beside the cab, when, on a sudden, it was blown to the ground, not even staggering as it fell, but falling just as if it had been a jointless piece of wood. While walking quickly against the wind, estimated at about 50 miles an hour—this was not the height of the storm,—Dr. Buchan says he was instantaneously brought to a stand by a gust so strong that the feeling produced was the same as if he "had unwittingly walked up against something solid, such as a shut door."

This hurricane was from the south. Only the other day (12th and 13th November 1901) we had one from the north-east which wrecked a house causing the death of a girl, carried away a staircase causing a man's death, and which dashed the revenue cutter *Active* against Granton breakwater, whereby twenty-two lives were lost. The maximum velocity of the wind on this occasion was, however, only 67 miles an hour, whereas during the hurricane of 1868 and the great storm of 20th December 1900 it exceeded 90 miles an hour.

I have dwelt upon the influence of Wind as a leading erosive agent in the Edinburgh district because I think its action there is often forgotten or minimised.

If you consider the long continuance of the denudation in the later geological epochs effected by the agents I have mentioned—(1) The Glaciers, Icebergs, and Icesheet of the Glacial Age; (2) The Action of

Frost; and (3) The Action of Wind—you will understand the cause of the sedimentary and even the igneous rocks in and around Edinburgh having that rounded, polished, smoothened, and mammilated appearance which they exhibit to-day.

10. Igneous Rocks and Scenery.

We now come to a very interesting subject of which the Physiography of Edinburgh furnishes an admirable illustration, viz., the supreme influence exercised by the Igneous rocks of a district in forming the Scenery of the district. By igneous rocks I mean those formed and erupted by the action of the intense internal heat of the earth, and those volcanic rocks which are the products of the action of volcanoes. Of course, igneous or fire-formed rocks are as different from aqueous or water-formed rocks as the Castle Rock is from Craigleith Quarry.

After what we have seen of the degradation by denuding agencies of the water-formed rocks of Edinburgh, it must be evident that had their long, rounded, smoothened surfaces been all that met the eye of the stranger visiting Edinburgh, he would certainly not have described it as one of the fairest scenes he had ever witnessed. Fortunately that degradation and platitude have been redeemed and are forgotten by reason of another class of rocks making their appearance in this district. I refer to rocks which are the products of igneous action, and were not laid down, like the others, layer by layer, in regular strata, by water.

Standing, as we are supposed to do, on the summit of Arthur's Seat and looking at the scene around us, we observe romantic crags breaking at intervals from the tame undulating country surrounding them and imparting to the scene a picturesqueness which it would not otherwise possess. We observe, too, that they differ from the surrounding rocks by their ruggedness, their colour, and their bold and isolated character, and that they seem to have defied the elements to which the others succumbed, and to stand there like grim survivors from the wreck of a previous age.

These rocks, to which Edinburgh is so much indebted for her scenery, are *igneous* rocks, the products of the great volcanic outbursts which occurred during Old Red and early Carboniferous times. How many volcanoes then existed in the Edinburgh district it is difficult to say, but I think we may locate one at Arthur's Seat, others throughout the Braid Hills and Northern Pentlands, and another at Torduff near Bonally. Whilst these volcanoes were throwing up ash, scoriæ and bombs, and whilst lava-streams were issuing from their flanks, other masses of lava burst through the aqueous rocks at other places, and now (owing chiefly to the denudation of the latter) tower hundreds of feet above them.

11. The Castle Rock Section.

Such was the Castle Rock; and if you desire an object-lesson and to learn how lava breaks through sandstones and forces its way upwards, you can easily obtain it by inspecting the famous section on the southern

side of the Castle Rock at Johnston Terrace, where you will see the contact between the lava-stream and the aqueous rocks, and can picture to yourselves the former seizing the latter in its fiery grip, and, whilst breaking its way through the strata, baking and calcining the sandstones with its terrific heat, and carrying portions of them with it in its wild rush upwards.

12. Edinburgh Trap Dykes.

All over the City's site outbursts of lava occurred, and what are termed "trap dykes" prove that ancient lava-streams poured through localities now known as St. Leonards, Buccleuch Place, Nicolson Street, Hillside, Lauriston, Chambers Street, High Street, Cowgate, Grassmarket, Spittal Street, Gilmore Place, Merchiston, Fountainbridge, Hanover Street, Water of Leith, Drummond Place, Brandon Street—in fact, no fewer than thirty Trap Dykes have been discovered in the area now occupied by the city, showing that the whole district had been subject to those great igneous convulsions and eruptions which we associate with areas of active volcanic disturbance.

13. Edinburgh Earthquakes.

Earthquakes are well-known concomitants of volcanoes, and although Edinburgh has experienced none of any importance in historical times, yet since the sixteenth century Earthquake shocks were felt in the Edinburgh district in November 1608, September 1789, September 1801, April 1886, February 1888, and somewhat remarkable shocks on 18th January 1889, the area of which I fully described and mapped in the *Scottish Geographical Magazine* for that year.

14. Crag and Tail.

Looking once more from our lofty conning-tower on Arthur's Seat, our eyes instinctively fasten on that magnificent height

> "where the huge Castle holds its state,
> And all the steep slope down
> Whose ridgy back heaves to the sky
> Piled deep and massy, close and high,
> Mine own romantic town!"

Sir Walter Scott here describes poetically, yet with his invariable accuracy, a natural phenomenon which is called "Crag and tail," and of which the Castle hill furnishes an excellent example. Let us consider its geology.

To the west we find at a low level stratified rocks, and rising through and far above them a mass of Basalt, a particularly hard igneous rock, which has been forced through the strata as already described. Upon this igneous mass Edinburgh Castle is built. Sloping gradually from the mass in an easterly direction, from the Castle Hill to Holyrood, are stratified rocks upon which the High Street and Canongate are built.

Thus we find a "crag" or igneous boss at the west end, with a "tail" of stratified rocks sloping down to the east. This is the phenomenon known as "Crag and tail." In this instance, the hard Castle rock has protected the softer sandstones behind it from some tremendous denuding agent issuing from the west—of the precise nature of which we are ignorant, but it was long before glacial times,—an agent which tore off the strata unprotected by the rock and left the Castle crag standing with its tail of strata extending behind it, just as you will see the stones on the seashore or in the brook each with a tail of sand or earth produced by the receding tide or the flowing stream.

Herculaneum was entombed under lava, whilst Pompeii was buried under clouds of ashes blown out of the volcano. The site of Edinburgh has known both of these terrible visitations. Whilst the Castle Rock represents a gigantic outburst of lava, the Calton Hill is largely the creation of volcanic ash. The layers of ash, however, being strengthened and upheld by layers of solid lava, the whole has proved a bulwark or "crag" to a "tail" of stratified rocks stretching to the east, thus furnishing another instance of the great denuding agent from the west having been defeated in its attempt to make a *tabula rasa* of the whole scene. It is, I repeat, owing to the successful resistance offered by these igneous rocks that eminences exist which impart beauty and variety to the scenery of Edinburgh.

In Corstorphine Hill we have an example of a vast sheet of Basalt towering above the sandstones which yielded to the denuding agencies of the past, whilst the hardness of the Basalt enabled it successfully to resist them. Similarly, the Porphyrite forming Blackford Hill and the greater part of the Pentland Hills had sufficient power to withstand the erosion which levelled the surrounding shales and sandstones. In a word, but for the outburst of igneous and volcanic violence which occurred in this district, the hills and crags we so much admire to-day, and which really *make* the scenery of Edinburgh, would not have existed, and a flat and uninteresting landscape would have been produced.

We have now discussed two of the four elements, Earth and Fire, as influencing in geological time the formation of the present physiography of our district. I propose to conclude this paper by glancing at the other two elements, Water and Air, the former as illustrated by the Rivers, Sea, and Lakes of our neighbourhood, the latter as connected with its Climate and Vegetation.

15. Rivers and Firth of Forth.

Viewed from a height like Arthur's Seat we survey a district watered by three rivers—the *Almond* on the west, the *Water of Leith* in the middle, and the *Esk* on the east. All are small streams, not exceeding thirty miles in length. The *Almond* rises among the uplands of Shotts in Lanarkshire, 900 feet above the sea, and falls into the Firth of Forth at Cramond. The *Water of Leith* springs from the north-western flanks of the Pentlands, 1000 feet above the sea, and falls into the Firth at

Leith. The *Esk* is divided into a North and a South Esk, the former rising amid the southern recesses of the Pentlands, over 1000 feet high, and the latter among the Moorfoot Hills at even a greater elevation. The North and South Esks unite below Dalkeith and fall into the Firth of Forth at Musselburgh. These three rivers form the natural water area of the Edinburgh district, and all flow northwards since the land slopes in that direction towards the sea. The antiquity of these streams may be judged from the fact that two of them, the Almond (a corruption of Avon) and the Esk, retain the names given them by the earliest Celtic settlers in Scotland, and both signify in Gaelic simply "water," or "a river."

The River Forth and its estuary at our doors, the Firth of Forth, nearly sever Scotland in twain, bisecting it as they do for nearly 90 miles from west to east. They have been formed since the sedimentary rocks were deposited, for these are found extending across the Firth, which follows a gradually deepening channel of 5, then 10, then 20 fathoms, and eventually discharges into a depression outside the Isle of May of 30 fathoms before reaching the great North Sea depression of 50 fathoms.

16. Ancient Lakes.

In comparatively recent times, however, the scenery of the Edinburgh district was diversified not only by rivers and sea, but also by lakes now represented by sorely shrunken descendants or by flat meadows, fields, and building stances. With the aid of Timothy Pont's map of Midlothian, published about 270 years ago, and other authorities, Mr. H. M. Cadell has described and mapped these old lakes, and has instanced the following as draining into the Water of Leith:—

1. A lake a mile in length which stretched from Gogar to Corstorphine, and communicated with

2. A lake two miles in length which stretched from Corstorphine to the Haymarket.

3. The "Burgh Loch," which occupied the entire "Meadows," drained into the latter lake. A windmill to the east of George Square raised water from the Burgh Loch to supply the Incorporation of Brewers.

4. A lake near Craigcrook.

5. A lake at Canonmills.

There was also the "Nor' Loch," occupying part of the site of the West Princes Street Gardens. This was, in 1742, a sheet of water 1800 feet long by 400 feet broad, although it had previously extended considerably further to the west.

Other lakes of greater antiquity were:—

1. A lake at Lochend (still partially remaining) which drained into the sea at Leith Links.

2. A lake nearly a mile long which covered the site of Holyrood and the east end of the Canongate and Cowgate. Its outflow and that of Dunsappie Loch entered the sea at Craigentinny.

3. Duddingston Loch, not in its present decrepitude, but a splendid

lake $1\frac{1}{2}$ miles in length by 1 mile in breadth. Its waters fell into the sea at the west end of the present Portobello. Connected by streams with Duddingston Loch were a lake between Craiglockhart and Morningside, and another on the south side of the Grange.

17. Fossil Wild Animals.

The wild animals of those olden times are worthy of notice to complete the picture. Remains of the moose or elk have been found at Duddingston Loch; those of the mammoth at Cliftonhall, near Edinburgh; and, with signs of the hyæna, those of the reindeer and the wolf at Dreghorn, near Edinburgh. The last-mentioned need not surprise us, for wolves were once so plentiful in Scotland that an act of the seventh Parliament of King James I., held in 1427, ordered barons to have them slain. The last Scottish wolf is said to have been killed in 1743.

18. The Climate of Edinburgh.

I next pass to a subject of some delicacy—the Climate of Edinburgh. If you ask a person who does not reside in our city what he thinks of it he will probably reply, "It would be a nice place, if it weren't for its east winds." The deliberate opinion of outsiders is that we have east winds in Edinburgh all the year round. This, of course, is absurd. Our prevalent winds are from the west, there being, on an average, 199 days of westerly wind in the year against only 84 of easterly winds. We have east winds no more frequently than other places, and when we do get them (chiefly in spring) they are no more keen or disagreeable than elsewhere. In fact, a friend of mine from Edinburgh who stayed in Dublin during one spring declared that the east winds of Edinburgh were nothing to those of Dublin, so far as piercing cold went.

But I must admit that, meteorologically, the position of Edinburgh is not all that is to be desired. True, the influence of the marine atmosphere of the city and of its being constantly agitated by wind tends to produce a much higher temperature in winter than that of towns situated inland or in air-locked positions. This fact makes Edinburgh one of the best winter residences to be found north of the Riviera.

Nor is our winter sunshine deficient. In November 1900, invalid friends of mine went to Hastings, as it was said to be the sunniest place in England, and I had the curiosity to compare its sunshine returns, which they sent me as published weekly, with my own observations of sunshine in Edinburgh for the same period. I was surprised to find that our city had enjoyed more hours of sunshine than the English Heliopolis.

At the same time, Edinburgh is surrounded on the south and south-west by a circle of hills and uplands, and when these are covered with snow the winds blowing over them become necessarily chilled. Thus, it is common in winter to hear in Edinburgh the exclamation, "What a cold East wind!" when really the wind comes from the south-west, but had crossed the snow-covered Pentland Hills, which attain an elevation of nearly 1900 feet above the sea.

The dwellers in Old Edinburgh, the "Auld Reekie" of popular parlance, were not, like these of modern Edinburgh, exposed to every wind that blew, for their houses were so closely packed together that they defied both wind and cold. Gordon of Rothiemay's beautiful bird's-eye view of Edinburgh shows us the town as it was in 1647, and I have no doubt that, to this day, the ancient houses of the Cowgate occupy a much more sheltered position than many of the modern houses of the wealthy. *Beati sunt pauperes.*

Glasgow people say that when they arrive in Edinburgh they always feel a "bite in the air." This is true, for they come from the relaxing climate of the West to the bracing climate of the East of Scotland; and that they appreciate the sanitary value of the latter is shown by their now deserting so much, for summer quarters, the Firth of Clyde and patronising the shores and golf-links of the Firth of Forth.

The Edinburgh climate, being of a bracing and stimulating character, is very favourable to physical and intellectual activity. No city stands higher than ours in the literary and scientific annals of the world. Its schools and University have been famous for generations. Its publishers, printers, and men of letters have had a world-wide clientage. Intellectual pursuits are a marked feature of the citizens. They are unwearied attenders of public lectures. They are great readers of books. Indeed, there are said to be, per head of the population, more books in Edinburgh than in any other city, except Rome. And, while I am on the subject of Physiography, I may add that I have been informed that half of the maps used by the world are produced in the city of Johnston and Bartholomew.

19. Latitude and Longitude.

It is not generally recognised that Edinburgh is further west than Liverpool, and much further west than London, their respective longitudes being—

London, . . .	0° 5′	west of Greenwich.
Liverpool, . .	2° 59′	„
Edinburgh, . .	3° 12′	„

This is caused by Scotland making a bend to the west at the English frontier. With regard to the latitude of Edinburgh (55° 57′ North), the fact that its latitude corresponds to that of Moscow proves that a city like ours, on a sea-coast influenced by the Gulf Stream, enjoys a mild winter climate, whilst an inland Continental city endures a rigorous one. Thus, whilst the mean temperature of Edinburgh in January is about 40° Fahrenheit, that of Moscow during that month is about 20°.

20. Temperature.

The temperature of Edinburgh is in winter much the same as that of London, but it is much lower than that of the latter in summer. Whilst in December the mean temperatures of Edinburgh and London may both be 40°, in July that of Edinburgh will be 58° against London's 64°. But Edinburgh has not, like London, a great river flowing through its midst and producing those most disagreeable fogs caused by a mixture of river-vapour, sulphur, and coal-dust. Again, although the tempera-

ture of Edinburgh is less than that of London in summer, the greater length of the day we then enjoy enables crops to ripen quite as well in Midlothian as in the south of England. On an average, the day at Edinburgh in June is 53 minutes longer than in London; in July 48 minutes, and in August 27 minutes. I am indebted to that eminent meteorologist, Dr. Buchan, for this calculation, which was kindly made by his directions, at my request, especially for this paper.

21. Rainfall.

As the winter temperatures of London and Edinburgh are practically identical, so there is little difference in regard to their mean annual rainfall, which is about 25 inches. Both capitals belong to that dry bracing East Coast border of Great Britain which contrasts with the West Coast as regards rainfall and general humidity. The further west you go in Britain the wetter and more relaxing the climate becomes. Whilst at Edinburgh you will measure 25 inches of rain per annum, at Glasgow you will measure 43, at Greenock 61, and at the head of Loch Fyne 127.

But, just as you observe the rainfall increasing as you ascend a river towards the mountains among which the river springs, so, when you leave the city of Edinburgh, and ascend the spurs of the Pentland Hills to the south, you find the rainfall rising also. I have stated the City rainfall at 25 inches per annum. This is at a height of 200 feet above the sea. Leaving the City and ascending southwards to 555 feet at Swanston, we find the rainfall to be 34 inches; at Clubbiedean (780 feet) 38½ inches; and at Colzium (1000 feet) 42½ inches, or nearly as much as Glasgow.

The fact is not generally known that the rainfall of Edinburgh is considerably less than that of that favourite winter resort, the Riviera. Comparing the rainfalls of Edinburgh and Nice as recorded during a long series of years, I find the following averages for their winter months:—

	Edinburgh. ins.	Nice. ins.
November	2·07	4·65
December	1·94	3·47
January	1·81	3·12
February	1·61	2·13
Total for winter	7·43	13·37

During 1901 the rainfall of Mentone was 46·85 inches, whilst that of Edinburgh was only 22·60 inches, or less than half.

Although we have surveyed the wonderful scene from Arthur's Seat from nearly every point of view, there remains one which appeals to every eye. I refer to the Vegetation and cultivation of the soil.

When the Celt or the Roman looked out from the spot on which we are supposed to be standing—the summit of Arthur's Seat—they beheld, no doubt, a lovely scene, where Nature displayed all her charms disturbed but little by Man. Great forests beautified by splendid lakes stretched

as far as the horizon, whilst here and there rose craggy strongholds, one of which was the *Castell Myned Agned* of the Celt, the *Castrum puellarum* of the Roman.

22. Agriculture.

Now, however, Man has by his restless activity brought the whole district under his subjection, and the plough passes where the red-deer roamed. The country around Edinburgh is agriculturally famous—soil, climate, and agricultural skill combining to make it one of the richest and best-farmed districts of Great Britain.

One of the most elaborate surveys of the vegetation of this neighbourhood was that made and mapped in 1900 by Mr. Robert Smith, B.Sc., of University College, Dundee—a talented youth, whose death, in the midst of his labours last year, deprived Scotland of one of her most promising students of Nature. Mr. Smith found that all the district round Edinburgh, with the exception of the hills and uplands, was suited to the cultivation of *wheat*, which is the highest praise that can be bestowed upon an agricultural district in this country.

I have had myself some share in valuing the land comprised in the county of Edinburgh, having prepared and published in 1878 an agricultural map of Midlothian, which met with the approval of the official County Assessor, the late Mr. William Kennedy. In this map I showed the varying rentals for which the land of the county might fairly be let. These rentals naturally grew higher and higher as the City was approached, because market and labour facilities were thereby increased. Whilst the uplands of Midlothian yielded a rental of under £1 per acre, lower-lying ground yielded from £1 to £2, and lower still £2 to £3 and £3 to £4. The Dalkeith and Liberton districts yielded from £4 to £5, whilst the land encircling Edinburgh on the NE. and NW., from Duddingston to Saughton Hall, was valued at from £5 to £6 per acre. Extra fertile portions to the East and NW. of the city also averaged from £6 to £8. Finally, the Craigentinny Meadows, enriched by the city sewage, returned the extraordinary rental of £20 to £40 per acre, a proof that what are called "waste products" are often products which are only waiting to be turned to splendid account.

23. Economic Geology.

Boon Nature has, however, not merely dowered the surface-soil of the Edinburgh district with fertility, she has likewise laden the ground beneath with treasures of great economic value. Important *coalfields* (still largely undeveloped) extend to the east of Edinburgh: great *shalefields*, productive of paraffin, extend to the west; whilst, in the immediate vicinity of the city, the water percolating through certain sandstones has enabled *Brewers* to produce a beverage for which Edinburgh has long been famed. *Building stones*, often of the rarest quality, are found in many quarries of the district; some, no doubt, nearly worked out, but not until they had helped to make Edinburgh—not, like London, a wilderness of brick—but a noble city built entirely of stone, a city which it is our joy to behold, and every grace of which it should be our duty to preserve.

24. City Improvements.

The citizens and the Corporation of Edinburgh have, during the past half-century, done their best to conserve her beauty. Any one who has looked at the views of our city executed by Thomas H. Shepherd about 1830 will admit that her appearance has been greatly improved since then. In 1830 the East Princes Street Gardens were a public bleaching-field, the Mound was, according to Lord Cockburn, "a deposit of rubbish," and the site of the Waverley Market was occupied by a rookery of tenement-houses. I remember hearing our illustrious townsman, the late Lord Moncreiff, remark that in his time Edinburgh had immensely improved in appearance; and since his day she has, I think, made herself more and more worthy to occupy the magnificent site which Nature has given her, a site which Man may embellish, but which, fortunately, he cannot destroy.

We have now considered the Physiography of Edinburgh under many different aspects, and I trust that I have given, in however broad an outline, a fair, full, and faithful description of the "place in Nature" occupied by the Scottish capital. It must always be a privilege and a pleasure to a citizen of Edinburgh to dwell upon her features, to celebrate her charms. If I have afforded any one any pleasure in reading these pages, I shall feel that my endeavour to describe the Physiography of Edinburgh has been amply rewarded.

APPENDICES.

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II.—Tables showing the Length of Day in Summer at London and Edinburgh respectively. Specially prepared by directions of Dr. Alex. Buchan, F.R.S., Secretary, Scottish Meteorological Society, 27th December 1901.

June.

Day.	London.		Edinburgh.		The day at Edinburgh is		
	H.	M.	H.	M.			
1	16	13	17	4	51	minutes	longer.
2	16	15	17	7	52	,,	,,
3	16	17	17	10	53	,,	,,
4	16	20	17	12	[1]52	,,	,,
5	16	21	17	14	53	,,	,,
6	16	23	17	16	53	,,	,,
7	16	23	17	18	55	,,	,,
8	16	25	17	20	55	,,	,,
9	16	26	17	22	[1]56	,,	,,
10	16	28	17	23	55	,,	,,
11	16	29	17	25	56	,,	,,
12	16	30	17	26	56	,,	,,
13	16	31	17	27	56	,,	,,
14	16	31	17	28	57	,,	,,
15	16	32	17	30	58	,,	,,
16	16	32	17	31	59	,,	,,
17	16	33	17	31	[1]58	,,	,,
18	16	33	17	32	[1]59	,,	,,
19	16	34	17	32	58	,,	,,
20	16	34	17	32	58	,,	,,
21	16	34	17	32	58	,,	,,
22	16	34	17	32	58	,,	,,
23	16	34	17	32	58	,,	,,
24	16	34	17	32	58	,,	,,
25	16	33	17	32	58	,,	,,
26	16	33	17	31	58	,,	,,
27	16	33	17	31	58	,,	,,
28	16	32	17	31	[1]59	,,	,,
29	16	32	17	29	57	,,	,,
30	16	30	17	28	58	,,	,,
					53·0 = Average.		

Hence—During the month of June the sun is above the horizon for 26 hours 30 minutes longer at Edinburgh than at London.

[1] These apparent irregularities are due to calculations having been made to minutes only, and not to seconds also.

JULY.

Day.	London.		Edinburgh.		The day at Edinburgh is
	H.	M.	H.	M.	
1	16	29	17	26	57 minutes longer.
2	16	29	17	25	56 ,, ,,
3	16	28	17	23	55 ,, ,,
4	16	26	17	21	55 ,, ,,
5	16	25	17	18	53 ,, ,,
6	16	23	17	16	53 ,, ,,
7	16	23	17	14	51 ,, ,,
8	16	21	17	12	51 ,, ,,
9	16	19	17	10	51 ,, ,,
10	16	18	17	8	[1]50 ,, ,,
11	16	16	17	6	[1]50 ,, ,,
12	16	13	17	4	[1]51 ,, ,,
13	16	11	17	2	51 ,, ,,
14	16	9	17	0	51 ,, ,,
15	16	7	16	57	50 ,, ,,
16	16	5	16	54	49 ,, ,,
17	16	3	16	52	49 ,, ,,
18	16	1	16	48	47 ,, ,,
19	15	58	16	46	48 ,, ,,
20	15	56	16	42	46 ,, ,,
21	15	54	16	40	46 ,, ,,
22	15	51	16	36	45 ,, ,,
23	15	48	16	34	46 ,, ,,
24	15	46	16	30	44 ,, ,,
25	15	43	16	26	43 ,, ,,
26	15	40	16	22	44 ,, ,,
27	15	37	16	20	43 ,, ,,
28	15	34	16	16	42 ,, ,,
29	15	31	16	12	41 ,, ,,
30	15	28	16	8	40 ,, ,,
31	15	26	16	6	40 ,, ,,
					48′·3 = Average.

Hence—During the month of July the sun is above the horizon for 24 hrs. 58 min. longer at Edinburgh than at London.

AUGUST.

Day.	London.		Edinburgh.		The day at Edinburgh is
	H.	M.	H.	M.	
1	15	22	16	2	40 minutes longer.
2	15	20	15	58	38 ,, ,,
3	15	16	15	54	38 ,, ,,
4	15	13	15	50	37 ,, ,,
5	15	10	15	46	36 ,, ,,
6	15	6	15	42	36 ,, ,,
7	15	2	15	38	36 ,, ,,
8	14	59	15	34	35 ,, ,,
9	14	56	15	30	34 ,, ,,
10	14	53	15	26	33 ,, ,,
11	14	50	15	20	30 ,, ,,
12	14	46	15	16	30 ,, ,,
13	14	43	15	12	29 ,, ,,

[1] These apparent irregularities are due to calculations having been made to minutes only, and not to seconds also.

AUGUST—*continued.*

Day.	London.		Edinburgh.		The day at Edinburgh is
	H.	M.	H.	M.	
14	14	39	15	7	28 minutes longer.
15	14	35	15	2	27 ,, ,,
16	14	32	14	58	26 ,, ,,
17	14	28	14	54	26 ,, ,,
18	14	25	14	50	25 ,, ,,
19	14	21	14	46	25 ,, ,,
20	14	17	14	42	25 ,, ,,
21	14	14	14	38	24 ,, ,,
22	14	10	14	33	23 ,, ,,
23	14	7	14	28	21 ,, ,,
24	14	3	14	24	21 ,, ,,
25	13	58	14	20	22 ,, ,,
26	13	55	14	16	21 ,, ,,
27	13	51	14	11	20 ,, ,,
28	13	48	14	6	18 ,, ,,
29	13	44	14	2	18 ,, ,,
30	13	41	13	57	16 ,, ,,
31	13	36	13	52	16 ,, ,,
					27·5 = Average.

Hence—During the month of August the sun is above the horizon for 14 hrs. 14 min. longer at Edinburgh than at London.

III.—TABLE showing the average number of days each Wind prevailed in the Edinburgh District (at Inveresk, Midlothian) during the 15 years ending 1871. (Founded on Dr. Buchan's statistics in *Journal*, Scottish Meteorological Society, July 1872, p. 302.)

MONTHS.	N.	NE.	E.	SE.	S.	SW.	W.	NW.	CALM.
SPRING—									
March,	4	4	2	2	3	9	4	3	0
April,	3	6	3	2	2	8	4	2	0
May,	4	7	3	1	3	7	4	2	0
Spring,	11	17	8	5	8	24	12	7	0
SUMMER—									
June,	4	4	1	2	3	8	5	3	0
July,	3	4	1	1	3	12	5	2	0
August,	2	3	1	1	4	11	6	3	0
Summer,	9	11	3	4	10	31	16	8	0
AUTUMN—									
September,	1	3	2	1	5	12	5	1	0
October,	2	2	3	2	5	10	5	2	0
November,	2	2	2	2	6	9	5	2	0
Autumn,	5	7	7	5	16	31	15	5	0
WINTER—									
December,	2	2	1	3	6	12	4	1	0
January,	2	1	1	3	7	11	4	2	0
February,	2	2	2	2	4	10	5	1	0
Winter,	6	5	4	8	17	33	13	4	0
Total for year,	31	40	22	22	51	119	56	24	0

LIFE AND TRAVEL AMONG THE PEOPLE OF THE CONGO.[1]

By Rev. Thomas Lewis.

It is no mean honour to be asked to address a Scottish audience on any subject pertaining to Central Africa, especially when we remember the magnificent service rendered by Scotchmen in the exploration and development of the Dark Continent. It would be impossible to mention the illustrious names of the sons of the North who have penetrated into the mysterious darkness of Africa, and illumined it, with the lustre of their own genius and self-sacrificing service, as explorers, administrators, and missionaries; but there is one name which shines out with unparalleled brilliancy among all modern explorers, viz., that of David Livingstone—a missionary whose name and example will always be an inspiration to every one who follows in his steps.

It is important in all African matters to remember the various interests represented by different classes of Europeans. We have :—

(1) The *Explorer* pure and simple, whose chief purpose is to pass through a country hitherto unknown, and gather all the information he can in regard to it, and then to return home and publish the results. This class rarely have to study the effects of their expedition upon the inhabitants of the country through which they pass, as they seldom cover the same ground twice.

(2) Then we have the *Trader* or *Gold-hunter*, whose whole business is to get possession of the produce or minerals of the land, and whose highest ambition is to make a vast fortune in as short a time as possible, and then retire to a better clime and more congenial life in the home-land.

(3) The third class is represented by the *Missionary*, who goes abroad with the intention of spending his whole life in the land, and applies himself to the conversion, education, and general uplifting of the native races.

(4) Then again we have another class in the *Administrators* and *Government officials*, who find it no easy matter sometimes to keep the other conflicting interests within bounds; occasionally they find that explorers, traders, and missionaries alike consider themselves equal to the task of governing the Government.

(5) There is, however, another interest in Central Africa which has been sadly neglected, and to a great extent ignored. I mean the interest of the *Native Races*. And I wish on this occasion to identify myself unreservedly with the cause of the African savage.

No one who has studied the African problem in its varied aspects during the past twenty years can help feeling some anxiety as to the future destiny of that great Continent. Rival powers have mapped out the whole of Africa for their special "spheres of influence," which influence is not always for the good of the country itself or of the

[1] A paper read before the Society on April 3rd.

nations who aspire to govern it. This rivalry of the nations has served its purpose in the discovery of unknown regions in Central Africa, and in solving the mysteries connected with the sources of the great rivers and the highlands and lakes of the interior. Now that the question of territory is practically settled, and the delimitation of boundaries proceeding apace, it is time for each power to consider well its policy in the development of the country and the government of its people. The future of this vast Continent depends not on its ivory and rubber trade, nor even on its mineral wealth: not on the discovery of gold and precious stones, but on the far more important discovery of the native himself. For you cannot govern Africa apart from the African. Especially is this the case in tropical regions, where Europeans cannot flourish and where everything depends on native labour. And I venture at this critical time in the history of African affairs to plead most fervently for a fuller recognition of the native element in your mission of civilisation. The Pan-African movement in South Africa must be taken as a sign of the times, which may spread itself over the whole Continent; and unless dealt with in a wise and statesmanlike manner, it may become a source of much confusion and trouble in the near future. When you have settled the present South African war there will arise above the political horizon another problem of far more importance and of vaster dimensions, and you will have to apply yourselves to this question of the native races with much caution and firmness. It is to be hoped that the race hatred and bitterness which exists in some parts will not become the chronic disease and curse of Central Africa.

The time has come when a thorough study of the native character is imperative, and we must inquire whether the African possesses the qualities necessary to enable him to take a prominent position in the development of his country. This question cannot be dismissed with such epithets as "savages," "niggers," or "inferior races." Our own ancestors were "savages." It is a question of evolution. Bring the natives into living touch with the glorious principles of what is best in our civilisation, and they cannot remain savages. The great danger of the present rush of European influences into Central Africa is to produce a superficial and spurious civilisation—a bad copy of the white man, with all his vices, but none of his virtues. What is needed is the genuine development of the native character by bringing to bear upon it the highest moral and Christian principles. Our aim must be *not to Europeanise, but to civilise*, and build up a structure suitable to the nature and temperament of the people.

The object of this paper, therefore, is to give some information relative to the African mind and character, as seen in the institutions and customs of the people, and to show that even among savage tribes there is abundant evidence of the power of subtle reasoning which sometimes may be considered equal to the cleverest feats of modern philosophers. Let me give one example from personal experience. Some years ago I was present at a native palaver, where a slave was accused of attempted murder in a neighbouring town. He managed to escape and got back to his people. Later on the family who prosecuted

presented themselves at his master's place, and demanded the life of the offender or a substantial sum of money, and a day was fixed for the palaver to be "talked." The owner was more ready to part with the slave than with his money, and kept him in irons to be delivered up on the appointed day and killed. But in this case the defending counsel was a philosopher as well as a lawyer. The prosecution stated their case and proved the offence, which took place in their town. According to Congo custom they ought to have caught the would-be murderer and brought him to his chief; but this was not done. So the counsel got up and said no doubt what they had said was all true, but as they had seen him in their town at the time they must know what had become of him, and that they must produce the man; and he proceeded to charge them with doing away with the slave without bringing him to them, as he had not been seen since. Counsel on both sides argued this point all day long, and the prosecution failed utterly to produce the culprit, although he was there in chains before everybody's eyes. The fact that both parties saw him before them, and talked to him, was not sufficient proof of the man's real existence, and the case collapsed. Could any civilised philosopher or lawyer do better?

The people of whom I speak are the Kongos and Zombos, two important tribes of the great Bantu family. They are subjects of the ancient kingdom of Kongo, and inhabit the northern portion of the province of Angola, in Portuguese Congo. The present king, who resides at S. Salvador, is not the important ruler that his predecessors were, and the Zombos have long ceased to pay allegiance to him. They speak the same language with a slight dialectical difference, but the tribal prejudice is very strong, and intercommunication is limited.

A philologist would find ample scope for his special branch here. It is a remarkable fact that the language of these undeveloped tribes, which has only been reduced to writing within the past twenty years, has the elements of some of the most cultured of European tongues. All words are derived from verbs which are rich in tenses and moods. The Kongo "verb" has three voices like that of the Greek—viz., active, passive, and middle, and the noun derived may have the force of any one of the three. This provides for the most varied and definite shades of meaning, and the natives seldom make a mistake in their choice of a word. The regularity of its rules and the nicety of its expressions point unmistakably to a habit of thought and force of intellect which are seldom associated with our idea of savages. Had we no other evidence than this of language, I would have no hesitation in saying that the Kongos are endowed with no mean gift of brain power, and are capable of such development as will make them of the greatest value in the advance march of progress into the heart of Africa.

Even in matters of *fetishism* and *superstition* they are not so simple as some give them the credit for being. I have yet to discover that most mythical of beings called the "Unsophisticated African." His system of fetishism is a most complicated one. The longer one studies it, the more astonished he is at the marvellous feats of mental exercises the Kongos

can perform. After nineteen years of careful study I have yet to master the intricacies of native superstition. But I have learned enough to know that a definite course of reasoning runs through the whole system. They begin with a belief in the great spirit-world, which is generally associated in their minds with forests where the spirits of the dead dwell after death. These spirits return to their old haunts, and are consequently greatly feared. This is the primary reason why burials are made the occasions for dancing and general festivities. They wish to appease the departed spirits by showing special attention to the body and honour to the family. For this reason also the dead bodies are wound up mummylike in cloth—sometimes many thousands of yards—of various qualities and colours, which are then kept for varied periods, according to the importance of the family, before the final burial festivities. Sometimes they are thus kept for over twenty years. The Kongos preserve their dead in a hut, and fires are kept burning night and day. This is exceedingly unhealthy, and the Portuguese Government have prohibited the custom at S. Salvador, where white men reside. In Zombo a better plan is followed. There they dig a large pit in the ground, and the cloth-bound body is suspended on two forked sticks fixed in the middle. Sticks are then laid across which are covered with branches and palm-leaves, and finally a thickness of earth, thus forming a vault. When the time for the funeral arrives, the body is taken out and removed to the burial-place, and interred in the ordinary way.

Funerals all through the land are of the first importance, and in more senses than one they are the chief end of life. A Kongo man lives and works only for a proper burial. He amasses cloth and beads and goats and pigs for this sole purpose, and he spends half his life in attending funerals, which are the chief festive occasions in the country.

As to witchcraft, the ordeal by poison and similar things, so much has been said and written by a host of travellers, that they can be passed over without any remarks from me. I would only remind you that all these are a part of a complicated system, cleverly thought out by the native "nganga," or priests, who may be classed among the most cunning rogues upon the face of the earth.

Whatever the raw savage lacks, it is not cunning or an active and creative brain. You see this in the astuteness of his trading transactions. He must be a sharp-witted man who gets the better of a Kongo man in his native market.

My experience of the Zombos dates back only to four years ago, when the Baptist Missionary Society, under whose auspices I have laboured in Africa, decided to make a forward move from S. Salvador in the direction of Zombo. The early missionaries, who settled at this ancient capital twenty-three years ago, looked towards the East and saw a range of hills some forty miles away, and on inquiry they were told that beyond on the plateau lay the Zombo country, whose people were very fierce and warlike, and would not allow white men to enter their territory. They learned, however, that this strong inland tribe supplied most of the markets with slaves, and many of them had been bought by

the king of Kongo, and had settled in the town. From them we gathered some valuable information about the country and the people.

At the request of our directors in London, in 1898 I made a prospecting journey into that region, with the object of selecting a site for a Mission station. My wife, as usual on my journeys, accompanied me. And it has been my experience that the presence of a white lady on a peaceful expedition into unknown districts is a decided advantage, for it goes far to disarm the suspicion of the natives, who are apt to think that every white man comes to take their country from them by force. Our first difficulty was to engage carriers, for the tribal jealousies are so strong that the Kongos were unwilling to enter a land the inhabitants of which were noted for their warlike propensities and savagery. At first they refused, but when they saw I meant to go, they changed their minds, for they would not allow "their white man" to be carried by strangers.

Travelling is a tedious affair on the Congo, and we are compelled to provide ourselves with everything we need in the shape of food, beds, chairs and tables, and cooking utensils, etc. We have no beasts of burden, and we have to use hammocks swung on a bamboo pole and carried by natives. Six men are told off for each hammock, and on fairly even roads they run with their burden at a good rate. Tents we use only when passing through sparsely populated parts. Those who are used to the climate and to the people prefer to camp in native villages, where they can be accommodated with a native hut. These huts are always dry and well smoked, and for this reason far healthier than when a tent is fixed on ground exposed to rain and dew, which at night fills one's tent with damp and malaria rising through the pores of the earth. A native never objects to our turning his few articles of furniture, in the shape of earthen pots, baskets, and empty bottles, out to the yard, and then one's lads can make an effective broom of palm-leaves, and clear out the dirt and much "creeping life" which polite lips never dare to describe.

We left S. Salvador in an easterly direction, with forty carriers, and on the fifth day we ascended the plateau at Diadia, and soon we were bordering on the Zombo country. The people were very timid and superstitious, and feared the presence of the white man; our appearance in a town or village was a signal for the women and children to run away and hide themselves in the bush, while the men would rush into their huts and bring out their loaded flint guns to meet us. On my shouting out in the native language and telling them who we were, they would come around us and engage in conversation. It was highly amusing to see the astonishment in their faces when they heard a white man talking in their own tongue, and the white lady was no end of wonder, especially to the women, who were particularly struck with the high pitch of a European lady's voice and her long hair. On several occasions my wife had to let down her hair for a private exhibition to satisfy the curiosity of the women. The African is never proud of his "wool," and envies the European his straight hair or long beard. Curling-irons would be the last thing an African young lady would desire.

As we proceeded on the Makela road, on the northern boundary of Zomboland, we were greatly interested in the numerous fetishes and charms exhibited at the entrance into towns and villages, and on one or two occasions we came upon witch-doctors holding their palavers, and carrying on their nefarious business of poisoning and killing innocent folks.

At that time two Europeans had just settled at Makela, one a Portuguese trader and the other an official of the Government in charge of a military post established near the boundary of Congo Free State. We halted there for a day or two, and received every attention at the hands of these gentlemen. The Government official was much concerned at my proposal to go further into the interior without what he called sufficient protection, and he wanted me to provide my men with firearms, and offered me a military escort. I thanked him for his kind thought and offer, but explained that I had always moved about among the people unarmed—that I did not possess a firearm myself, and that I never allowed a carrier to carry one. And I have never had any occasion to regret this rule or to modify it. He shrugged his shoulders at my very peculiar scruples, and we departed with many expressions of good wishes for a prosperous journey. We continued our journey eastward until we reached the Nkissi river, known in this district as the Nzadi a Malewa, and found the people speaking a different dialect, but not so different that we could not understand them. The swampy valley of Malewa was anything but inviting, and we therefore retraced our steps, and made for the district of Kibokolo, which lies to the south of Makela. We had heard of this district, from Zombo slaves at S. Salvador; and when we saw the population with its many towns and villages, we decided at once that it was the district which we were seeking for, and remarkably suitable for our purpose. After some trouble we found the principal town, but my headman experienced considerable difficulty in finding the chief. He was not to be seen anywhere, and the people were very timid, but came in crowds to stare at us. At last the chief was brought out from his hiding-place, and he came with his headmen to receive me. This was done in native style, with much etiquette, and he showed us a respectable hut to sleep in. This done, we proceeded to make our residence habitable, in the usual way, while the carriers were shown two other houses for their use. Later on the chief and his people came, and we held a palaver, at which I gave them practically an historical sketch of my life and of our business in their country. I told them that we had been at S. Salvador for many years, teaching the people to read and to write and various trades, and that we were looking for a place where we could do the same in Zombo. After some further talk the chief replied that, as he was one of many chiefs in the country, he could not give any answer to me, but he would call together the other chiefs of the district to-morrow, and I could then repeat in their presence what I had told him that day, and then they could give me an answer. This I considered satisfactory, and was delighted with the progress of things. "To-morrow" came, but it happened to be a market-day, and a market-day in Zombo is in some

respects similar to that of some other countries—the people get home the worse for drink. Drink is a terrible curse in Africa—not only the "fire-water" made in Hamburg and thrust upon them by all European nations alike—but the fermented palm wine and a decoction of cassava beer, which is brewed in large quantities in Zombo. The town was restfully quiet that morning, for they had gone to market, and I was looking out for the promised meeting of chiefs. I found out afterwards that instead of coming to me these gentlemen had gathered themselves at a great palaver in the market-place, a mile and a half away. They were discussing the presence of the white man in their country, and how best to get rid of him. The majority were in favour of killing him and his wife and carriers, and that would prevent any more coming; but the Kibokolo folks were afraid to have a white man killed in their town, and they managed to effect a compromise with the others, and it was finally agreed upon to go and drive him away from their towns, and if he refused, they would beat him and his wife and carriers, and force them away. So about two o'clock that day—and I was perfectly ignorant of what had occurred at the market-place—there was a great outcry on the opposite side of the stream which runs through the midst of the towns, and there were hundreds of natives, covered with their war-paint, rushing down wildly in our direction. When they reached the water they saw our lads there washing their clothes. We had given them a piece of soap, and the soapsuds on the surface of the water created quite a sensation. They had never seen such a thing before, for they had no use for soap in that land, and the cry was raised, "See what the white man has done; he has sent down his boys to poison our water." Our lads had to run for their lives, leaving their garments behind. In far less time than I can speak about it, we were surrounded by a wild and savage crowd of people, brandishing their cutlasses and spears, and firing their guns over our heads, demanding our immediate departure from their land. I gathered all my men behind me, for it was of the first importance to keep them quiet and avoid a fight. By this time the witch-doctors and the women were crowding around us, displaying their fetishes and charms, and shouting and dancing, and hurling insults at us. Then the town band appeared in the shape of large drums and ivory horns, which they blew with terrific effect, and altogether it was like pandemonium let loose upon us. By dint of shouting I managed to get some of the headmen to hear me, and demanded to know the reason of all this excitement and noise. The only thing I could get out of them was that I must go away at once, for the people were going to kill me. This I refused to do, and told them we should stay there until next day. The chief then sent begging me to leave, that his people had gone mad. The fury of the crowd grew in strength, and the headmen renewed their effort to get us to leave, or they would kill us. I replied that if that was all they wanted, they could do it easily without making such noise and fuss—that we were there without any weapons, and that we would not fight. They were so taken aback with my answer that they did not know what to do; but they kept on with their threats, and their ardour did not cool all through

the night. At half-past five we had our evening meal, as usual, in the open space in front of our hut—for we never have our meals inside in these journeys; if we did, the people would swarm like bees and block the doorway in trying to see the strange people feed, and we could get no air. So we always dine in public. After our usual worship with the carriers we retired to rest, and in spite of the howling mob outside, we managed to have a fair amount of sleep. Next morning there was no difficulty with carriers about starting—they had everything ready at dawn, but we waited breakfast first, and proceeded leisurely about it. I sent my messenger to take leave of the chief, but he refused to come to me or to accept my present, and we went away a sadly disappointed party, followed by the frantic crowd, firing their guns and driving us away.

We were now on the way back to Kongo, and on this return journey a remarkable incident occurred. We missionaries call such occurrences interpositions of Divine Providence. We had travelled only a few days when we met about five hundred Zombos returning from the direction of the coast with loads of rubber on their shoulders. They had been unable to go to the coast on account of a native war which had occurred in the Lembelwa district, not far from S. Salvador. The trade *routes* were closed, and all the people were in arms. I assured these Zombos that I knew all the chiefs of Lembelwa, and if they would come back with me I could take them through in safety. At first they thought I was laying a trap for them to retaliate for the treatment I had received in their country, but ultimately they decided to trust themselves in my hand. When we reached Lembelwa I found that their story was correct. I took my position in front of all the men, and on emerging out of the grass into the open space in the town I found the road guarded by armed men, and the principal chiefs among them. Being old and intimate friends, I took matters in my own hand, and deposited the chiefs on the grass at the side of the path. This was simply a matter of form to relieve them of the responsibility of allowing us to pass. At each of the towns I left word for the chiefs of the district to come and see me at the camping-place that night. They all came, and we held a palaver. Each side in the quarrel had much to say on the subject, and when they had relieved their minds with much oratory and gesticulations, they appealed to me to arbitrate. I accepted the office, and exercised the utmost impartiality by blaming both sides and giving them a strongly worded lecture on the foolishness and wickedness of their course of action. The outcome of this was a settlement of the dispute and the reopening of the road.

These Zombos went to the coast and sold their rubber, and came back with their merchandise and told their people in Zombo that it was the white man whom they had driven away that helped them in their trouble and settled the road palaver.

A few months later the Kibokolo folks were in trouble. A neighbouring tribe had a quarrel with them and threatened war upon them. The chiefs and people assembled once more at their market-place, this time to discuss their own difficulties, and after several days' "palavering"

they arrived at the conclusion that if they could get that white man whom they had driven away a few months before to come back, he would be able to help them as he did in the Lembelwa district, and they despatched special messengers to S. Salvador, begging us to return and settle down in their town. So it came to pass that exactly twelve months from the time we were driven away by a furious mob, my wife and I were on our way back to Zombo, and this time the Kibokolo folks came out to meet us, and for three days they marched in front of us, with drums and horns, firing guns, and dancing, but this time to welcome us as their "white men." Thus we have entered into this long-neglected and unexplored region of Zombo, and for some years to come I hope to make Kibokolo my home and base for further journeys of exploration to the south and east—a large tract of country altogether unknown to Europeans.

I have already described the features of these highlands of Zombo from a geographical point of view both in London and Glasgow, and need not repeat the description here.

The climate of Zombo, compared with that of the Congo in general is healthy. At Kibokolo, although for the past three years we have lived in a rough way in temporary grass houses, our health has been excellent. The same thing might be said of the Portuguese at Makela, who say that the climate is equal to that of Portugal, which is doubtful. It is too soon yet to speak with any degree of certainty on this point, and time alone can decide it. But with an altitude of over 3000 feet above sea-level, a sandy and well-drained soil, with an abundant supply of excellent water, clear as crystal in the numerous streams, I see no reason why it should not be a fairly healthy climate. Certainly it is a vast improvement on the swampy lowlands of the Congo valley.

The Zombos are similar to the Kongos in their habits and customs, but more industrious. Unlike the Kongos, the men do a fair amount of farm-work, and do not depend so absolutely for their living on the labour of their wives. They are also keen traders, and spend much of their time in collecting rubber from the rubber-producing districts towards the east, and take it to the coast, principally to Noki on the river, but often they journey as far as Ambrizette and Loanda on the coast, where they exchange their produce for powder, salt, cotton, and other goods.

These highlands are more thickly populated than the region of the coast, and the people seem to thrive better. The sleep sickness so virulent on the river is not so prevalent here.

The standard of morality is low, and polygamy is the rule. Marriage is chiefly a business transaction arranged between families, and is not by any means indissoluble; the bond may be cancelled by the simple process of returning the money. In the native language the transaction is spoken of as "borrowing." In the case of a free woman she is still in the power of her family and under their protection; and the children born to them are under the control of her family—the natural father having no voice in their management. The wife is a "borrowed" article, and nothing more. This places the woman in an independent position,

and in many respects it is a protection. If the husband ill-treats his wife she can run away to her family and claim their assistance, and if need be the marriage can be dissolved. This naturally leads to no end of family troubles and tribal disputes. It is not so with a *slave wife*; she is the property of her husband, and the father has full control over his children. From the man's point of view this is much more satisfactory, and costs him less than the usual sum paid for the "borrowed" free woman.

This, together with the institution of polygamy, makes the family relationship a very complicated affair. Families are always traced through the women. The law of succession is not from father to son, but from father to nephew on the sister's side. The legal inheritor of a man's property is the eldest son of his eldest sister. This seems strange, but a careful study of the system of polygamy and native customs regarding the marriage state shows no other way practicable.

This brings me to the important question of *Slavery*. There is much ignorance and misconception in regard to this matter. First of all, we must distinguish between the *Slave Trade* and what is known as *Domestic Slavery*. Both are essentially wrong, and the sooner they are swept away from the face of the earth the better. The *Slave Trade* consists of capturing and buying slaves, either for export or for labour in plantations within the country. This vile traffic has been, and still is, the curse of Central Africa, and it is the duty of every civilised Government to come down on it with a strong hand and prohibit it by all the means in its power. *Domestic Slavery* is a more difficult term to define. There is buying and selling in the native markets, but the slaves become attached to the family, and are not bought with the intention of reselling or of making profit by the transaction. A man may buy women slaves to become his wives, or young men to become husbands of his women-folk. The importance or social position of an African is estimated by the size of his family or the number of his wives. Hence he buys slaves to increase the number of his clan. They are his property, and may be considered his assets if he gets into financial difficulties. This is what is called domestic slavery.

Many natives become slaves of their own free will. If a man has no relations, life as a free being becomes almost intolerable to him. He has nobody to protect him, and, the saddest thing of all, he cannot get a wife anywhere. So he will approach the head of some family, and asks to be received as a slave. Then he is provided with a wife, and if children are born of the marriage he becomes practically a part of the family, and he is his own master to a great extent.

A peculiar feature of this system is the provision made to enable a slave to escape from a bad master. Should a slave desire to exchange masters, he has only to persuade another man to receive him, who is willing to pay a fair price for him. This transfer is called "eating a goat"; for when a runaway slave seeks the protection of a new master he is given a meal, including some goat's flesh, a token of his acceptance, and that his protector is willing to settle the claims of his former master. This is constantly being done, and "to eat a goat" is a settled

phrase in their language, and is very expressive: thus a convert from heathenism to Christianity is spoken of as a man who has "eaten God's goat," which means that such a man has escaped from one master and claimed the protection of another.

In dealing with the question of *slavery*, therefore, we must carefully distinguish between these two systems, and attack them from different positions and with different weapons. The *trade* must be put down with an iron hand by all the Governments responsible for the welfare of their respective spheres, and on the whole this is being done by the administrations that are under the direct control of European Governments. But I venture to think that *domestic* slavery must be approached by a different method. This institution cannot be abolished by force of arms. It is a part of a great system upon which all the laws and customs of the people may be said to stand. To deal with it successfully we must lift the moral standard of the people to a higher level, develop their character, and educate them to loftier ideas and ambitions. In vain we attempt to pull down the old structure of savage laws and institutions if we can give them no clearer vision of the nobler temple of civilisation and progress. We shall rescue the downtrodden slaves of Central Africa only when we succeed in imparting into the African mind the principles and rudiments of freedom and humanity. What we need is not suppressive laws and regulations, but the building up of free institutions that will develop the native mind and understanding, and give the people higher ideals and a wider view of life. Give Africa more "Lovedales" and "Blantyres," with their schools and industries, and the whole fabric of slavery and cruelty will fall to the ground.

It is a matter for sincere congratulations that our Governments are beginning to realise the importance of protecting the native races. The Portuguese Government has discovered that the constant export of the best blood of Angola and Congo carried on under the system of "contract labour" (*serviçães*) has been the ruin of their colony, and there is good reason to hope that the bill recently introduced in the Lisbon Parliament will put an end to this infamous business once for all. This system has been the one dark blot on the Administration. Its officers hitherto have made it their principal business to recruit carriers and employees for the different trading firms at Makela, forgetting that they had any obligations to protect the liberty of Portugal's dark subjects. They are now paying the penalty of their misguided policy. No country can prosper under such conditions. Slavery is always the same, whether we call it by its old name, or by the more modern appellation of "contracted" or of "forced labour."

I must hasten to say, however, that the Portuguese treatment of the native is not cruel or hard. Those who enjoy the protection of the Portuguese Government have much to be thankful for; and I have noticed that the natives on the undefined borders of the Congo State are most anxious to claim that their towns are in Portuguese territory. We have been shocked beyond measure during the past few years with the accounts of terrible barbarities perpetrated upon natives by the officers and agents of a neighbouring state: but as far as I am aware, no charges

of this character have been brought against the Portuguese. Their Government is most inoffensive, and I am glad of an opportunity to bear witness to the humanity and kind-heartedness of its agents in dealing with the natives. I have also to acknowledge the ready help which they have rendered to us in matters concerning the welfare of the natives, and the equal treatment which they have meted out to Protestants and Catholics, to English and Portuguese alike.

In conclusion, is it too much to hope that the sword will now remain in its scabbard in Africa, and that all nationalities and sections shall join hands in the most noble of all enterprises, viz., the uplifting of the native races, and equipping them for the prominent part which they are destined to take in the development of their country? There is a great task before us. For ages past the land has been drained of its best life to supply plantations with *slave labour*, as if the Continent of Africa only existed for that purpose.

At the dawn of this twentieth century a new light has been thrown across the darkness, and a new era has commenced in the history of Africa in which the African shall be recognised as a fellow-man and a fellow-worker. Let the Angel of Peace fly aloft, and let Civilisation spread her silver wings over the length and breadth of the Continent; then shall the wilderness become a garden, and Africa shall become the pride of all the nations, and the black man and the white man shall rejoice together, in peace and in love.

THE EVOLUTION OF THE ANTILLES.

By J. D. Falconer, M.A., B.Sc.

Alexander von Humboldt enunciated two great ideas about the structure of the New World. In the one he insisted upon the geological continuity of the great mountain-systems from Alaska to Fuegia: in the other he asserted that between the twin continents there was formerly intercalated a third element, a third America, now represented only by the submerged mountain-chain of the Antilles. Modern scientific research, while it has largely modified the former, has strongly confirmed the latter idea, and has afforded us data from which the geography of the lost land at different periods can be at least partially restored.

Omitting for the moment all details of the central region, we may take first a general survey of the origin of the New World and its connection with the Antilles. It will be readily granted that the presence of a complex of Archæan or pre-Cambrian rocks appearing now at the surface over wide areas, or partially covered by unconformable strata of later age, indicates the probable distribution of the dry land at the beginning of Palæozoic time. The most extensive development of Archæan gneisses, schists, and plutonic intrusions in America occurs in the Laurentian district of Canada, stretching from the St. Lawrence and the Great Lakes away to the north-west along the

valley of the Mackenzie River. A similar complex occurs in the highlands of Brazil and Guiana, and appears in different parts of the chains of the Andes, the Rockies, the Appalachians, the mountains of North Venezuela and Guatemala and the islands of the Greater Antilles. Connecting together the various tracts, we may picture the site of the New World occupied in these early times by two great Mediterraneans. The northern was bounded to the NW. by the Laurentian Mountains and encircled on the other sides by groups of islands occupying the sites of the Appalachians and the Rocky Mountains, the Antilles and Guatemala. Similarly the southern was bounded on the east and north by the archipelagoes of the Andes and of Venezuela, while on the west it washed the shores of the Guiana and Brazilian highlands and the Tandil and Ventana heights. The Caribbean Sea was probably also delineated at this time by groups of islands on the east and west, connecting together the transverse ridges of the Antilles and North Venezuela. Thus from the very beginning the plans for the New World were drawn out and the foundations of the great mountain-chains were laid, and the story of the succeeding ages is largely the history of the building of the mountains and the filling up of the seas.

During Palæozoic times great longitudinal troughs or geosynclinals were formed on either side of the primitive mountain ridges, and into these the waste of the highlands was washed. As the result of gentle lateral compression, the floors of these great basins gradually sank, while the intervening ridges as slowly rose. Possibly connected also with the formation of these geosynclinals to the north and south was the elevation of the central region. The entire district between the Equator and the Tropic of Cancer was, with the probable exception of a large inland sea on the site of the Caribbean, apparently high and dry during the whole of the Palæozoic era. Progress in mountain-building, however, was slow until the close of Palæozoic time. Then orogenic activity manifested itself chiefly in the east of North America in the upheaval in a series of longitudinal folds of the Appalachian system, including the whole of the eastern half of the United States. North America to the east of the ninety-fifth parallel was now for the most part finished, and has never been again entirely submerged. Minor ridges were formed in the Nevada district in the west and in the vicinity of Lake Titicaca in South America. The remarkable feature of this period, however, is the existence of continuous land from Hudson Bay to the Orinoco, while the western portions of both continents were still drowned in water with the exception of the protaxes of the future mountains.

This condition of affairs continued until well on in the Mesozoic era. It was not until the close of Jurassic time that the floors of the great geosynclinals were disturbed to any great extent. Then, however, the Sierra Nevada and the coast ranges of the north were upheaved as well as the principal chain of the Andes, south of Peru. The Mexican plateau was elevated in early Cretaceous times, and the great Mediterraneans were shallowed especially in the north, where fresh water or marshy conditions largely prevailed at this time. Subsidence speedily

followed, however, until towards the close of the Cretaceous period the maximum depression was experienced in North and South America. Simultaneously with this second subsidence began the sinking of the two transverse mountain-chains of the Antilles and North Venezuela, which had up to this time formed an extensive tract of land. Only small islands, smaller even than the present Antilles, remained above the surface, while the Atlantic and the Pacific Oceans again mingled their waters across Central America. The end of the Cretaceous was marked however by great orogenic activity. The Rocky Mountains, the Northern Andes, and the Venezuelan coast ranges were now upheaved, followed later by the mountains of the Antilles. Igneous eruptions were a marked feature of both the earlier and the later stages. The lavas of Wyoming, Montana, Yellowstone Park, and the western Cordillera of Ecuador were poured out at or near the close of the Cretaceous. Probably about the same time also the volcanoes of Central America were established along an independent line, and the ancient lavas were accumulated on the site of the Lesser Antilles.

Thus in early Tertiary times the Americas had largely assumed their present aspect. The elevation of the mountain-ranges, however, and of the continents as a whole, was much less than it is at present. The Gulf of Mexico was continuous with the Atlantic over the peninsula of Florida: Central America was represented by a volcanic archipelago: the Antilles were farther invaded than now by the Caribbean Sea, and great lakes covered the interior of both continents. The extensive elevation of the continental areas was the work of Tertiary times. Great longitudinal geoanticlinals were slowly formed, and much faulting and fracturing took place along old and new lines of weakness. The Miocene saw Florida united through the Bahamas with the Antilles, and the maximum elevation over the whole of the New World was reached in early Pleistocene times, when the Antillean plateau formed a complete land connection between North and South America. The bridge was soon after broken and shattered, probably through subterranean movements connected with the establishment of the transverse volcanic fissure in Mexico and the faulting of the Venezuelan coast. The general elevation, however, appears to have had little effect on Central America, across which the waters of the Pacific entered the Caribbean Sea during the whole of the Tertiary era. Various minor upheavals and oscillations of level not yet fully investigated have affected the central archipelagoes in Tertiary and recent times.

We come now to the more detailed account of Central America and the Antilles. It is important to note in working out the history of this region that nowhere east of Tehuantepec between the fifth and twenty-fifth parallels do there occur fossiliferous deposits which can be definitely assigned to any period earlier than the Lower Cretaceous, while the Cretaceous beds themselves are always more or less disturbed, often contorted and metamorphosed, and everywhere overlaid in the low grounds by the later Tertiary deposits. It is at once apparent that dry land existed here until Jurassic times, and that extensive upheaval took place at the beginning of the Tertiary era.

Beginning with Central America, we are at once struck with the great line of volcanoes which extend along the Pacific coast from Soconusco in Guatemala to Chiriqui in Panama. The volcanoes, many of which are now extinct or dormant, are arranged along two fissures, which meet at an obtuse angle in the Bay of Fonseca. The whole system is entirely independent of the other volcanic bands in North and South America, although it probably dates back with them to post-Cretaceous times. It is believed that these volcanoes have played a large part in building up the narrow neck of land which now unites the two continents. Suess[1] draws attention to the curious fact that the displacement of the craters in the successive eruptions has taken place in every case along transverse lines of fracture of varying length according to the number of the eruptions, and always in the direction of the Pacific. At each of the original points of eruption there seems to have been formed a fissure normal to the principal volcanic axis, and along these fissures the volcanoes are marching in line towards the Pacific. On the Atlantic side of Central America there exists, although overshadowed by the lofty volcanoes, what appears to be at first sight a second range of mountains, approaching the coast in the Bay of Honduras and converging to meet the volcanic series in Guatemala and Costa Rica. Investigation has shown, however, that this is really not one continuous range but a complex of transverse and longitudinal intersecting ridges which never attain individually any great length. These mountains are entirely without relation to the volcanic line, which truncates them along the Pacific margin and only accidentally coincides with them in the north-west and south-east. All are composed of ancient gneisses and schists with intrusive granites, syenites, and other plutonic rocks, followed in places by Cretaceous sandstones, conglomerates, and limestones, the whole overlaid towards the coast, and especially in Yucatan, by thick Tertiary deposits. These mountains are connected beyond Tehuantepec with the ancient crystalline rocks of the Mexican sierras and with a similar complex in Panama beyond the termination of the volcanic line.

In Colombia we find the Andes dividing into four distinct ranges immediately north of Ecuador. Of these the most westerly, the Choco mountains, are probably continued as the crystalline Veragua range of Panama. Farther east come the Western and Central Cordilleras, separated by the Cauca valley. These, like the coast range, are very imperfectly known. The Eastern Cordillera, however, has been studied by Hettner. It sweeps round to the north-east into Venezuela, where it bifurcates to surround the Gulf of Maracaibo on the west and south. The southern branch, the Sierra de Merida, is prolonged in Venezuela to meet the Carib mountains, which skirt the coast from the Gulf of Triste to Trinidad. The two ranges meet at an obtuse angle in the much folded and contorted district of Barquisimeto. The structure of these ranges is the same throughout. A central zone of ancient crystalline and eruptive rocks is flanked on either side by Cretaceous strata, frequently at high angles, which in Trinidad become the storehouses of bitumen. The isolated district of the Sierra de Santa Marta and the peninsula of Goajira are entirely composed of ancient crystalline and schistose rocks,

[1] *La Face de la Terre*, 1897.

with the Maracaibo Cretaceous to the south, and Sievers suggests that they represent the beginning of another range now submerged, which ran parallel to the Carib mountains through the islands of Oruba, Curazoa, and Buen Aire. Miocene deposits are said to occur in several places along the coast, especially in the peninsula of Paraguana, while, according to Suess, the later Tertiaries have penetrated into the interior through the Gulf of Barcelona and disappear beneath the llanos of the Orinoco. If this is so, the extensive faulting so apparent along the Caribbean shore must be referred to pre-Miocene times. But it is permissible to doubt the occurrence of Miocene deposits in this region, on account of their total absence in the island of Trinidad,[1] while the broken Pleistocene bridge to the north seems to favour the more recent origin of the fault. The Gulf of Maracaibo is believed by Hettner and Sievers to occupy the centre of another faulted basin. Readjustments appear to be still taking place along the coast. The districts of Caracas and Cumana are noted for their earthquakes, and the Gulf of Curiaco is said to have been formed by a great convulsion which took place not long before the discovery of America. Volcanic action, though now quiescent, is accountable for the larger part of the island of Tobago and for an alleged extensive accumulation of recent lavas between the gulfs of Curiaco and Paria.

The islands of the Greater Antilles from Cuba and Jamaica to the Virgin islands all exhibit the same geological structure. The mountains show a central axis of gneiss, granite, and ancient eruptive rocks, followed by alternations of glauconitic sands, marls, and unfossiliferous siliceous limestones with layers of asphalt, the whole frequently metamorphosed into black schists, quartzites, and marbles. This series is analogous to the lower beds of the European Flysch. These are followed by fossiliferous limestones of middle Cretaceous age, the whole overlaid in the low grounds by thick Tertiary and recent deposits of orbitoitic and coralline limestone. The same crystalline axis and the same general succession is found in the mountains of Trinidad and North Venezuela, in Guatemala and Honduras, and, according to Suess, in parts of Barbados and Guadeloupe. This similarity of structure suggests a common origin, and the trend of the insular mountains indicates their former existence as a series of connected ridges. The centre of the Antillean group was apparently in the eastern part of the island of Haiti, from which two ridges diverged towards the west. One passed through the north-western peninsula of Haiti, the Sierra Maestra of Cuba, the Great and Little Caymans, and the Misterios banks to Guatemala. The other ran from the south-western peninsula of Haiti, through the Blue mountains of Jamaica and the Pedro and Serranilla banks to Honduras. The mountains were continued to the east as a single range, now largely submerged, which curved sharply round through Barbados to Trinidad and Venezuela.

The majority of the Lesser Antilles are of volcanic origin, composed of recent lavas covering a more ancient igneous basement, which is referred to late Cretaceous or early Eocene age.[1] They represent the remains of a line of volcanoes which were established about the same time as those of Central America, and had, like the latter, an Archæan

[1] Spencer, *The Windward Islands. Trans. Canad. Inst.*, 1901.

and Cretaceous ridge to the east, portions of which are still visible in Guadeloupe and Barbados. The bituminous pits of the latter island indicate its intimate relation with Trinidad. Some of the smaller islands, for example Anegada, Sombrero, and Barbuda are entirely composed of white limestone, and probably rise on a similar igneous foundation. The deposits appear to be of Oligocene age overlaid by Pleistocene. Peculiar deposits of radiolarian and foraminiferal marl and red clay occur in Barbados and Trinidad, and pass under the Oligocene limestone. They are believed to have been accumulated in abysses of the ocean at a depth of two miles or more during the period of maximum depression.

The Bahamas and the Bahama Bank connect Florida with Haiti and Puerto Rico. They are supposed to have an Archæan axis, but no borings yet made have gone below the Cretaceous. White foraminiferal limestone of Oligocene age, composed largely of the tests of *Orbitoides Mantelli*, forms the surface rock, and is flanked by Pleistocene deposits in these islands as throughout the Antilles. This absence of any deposits of Miocene or Pliocene age throughout the archipelago appears to indicate the existence of dry land conditions during that period; and that the islands were so far elevated as to form a continuous land connection between Florida and Venezuela is confirmed along various lines of evidence. Remains of early Pleistocene elephants and large rodents have recently been found in a limestone cavern in the island of Anguilla. Guadeloupe has also furnished the remains of a small Pleistocene South American elephant. These animals must have migrated from the continent during the period of maximum elevation. Further, Agassiz has shown that the fauna of the deepest parts of the Gulf of Mexico and the Caribbean Sea bears a greater resemblance to the deep-sea fauna of the Pacific than to that of the Atlantic. This indicates not only a continuous isthmus between North and South America, but the free passage of the Pacific across Central America. Bland has shown further that the land snails of the islands from Cuba to Antigua are closely related to those of Mexico and Central America, while those of Antigua and St. Kitts to Trinidad have South American affinities. The Gulf of Mexico became an inland sea subject to periodical invasions of the Pacific, for the shore deposits include between the Oligocene limestone and the recent marine accumulations the peculiar *Grand Gulf Series* which appears to be of fresh or brackish water origin.

The Antillean plateau was submerged and shattered by extensive faulting soon after the beginning of Pleistocene times. The volcanoes of Mexico may perhaps have some connection with this subsidence. Although many of these are now dormant or extinct, the cones are still perfect and have evidently been exposed to denudation for a comparatively short time. Moreover they are all set on a transverse line which runs approximately along the nineteenth parallel. The prolongation of this line passes along the truncated southern border of the Sierra Maestra in Cuba, and through some of the deepest parts of the Caribbean Sea into the Brownson Deep. This may possibly indicate the line of one of the larger faults, and if the fracture of the Venezuelan

coast may be referred to the same period, the two faults would form a trough into which the Antilles would sink with increasing downthrow towards the east. Since this great subsidence the islands have been undergoing gradual elevation, a series of terraces, well seen in Barbados, having been cut out of the new coral reefs as the land was rising. Central America has also shared in the recent oscillations. Biological observation has shown that while the marine molluscs and fish are on the whole of distinct species on either side of the isthmus, a large number of fish but very few molluscs are identical. This points to a subsidence of comparatively short duration within recent times. The whole configuration of the land and the distribution of the islands in the New World may be explained according to Suess by the interaction of two sets of waves of compression advancing originally at right angles to each other. If of equal inertia, the result of their meeting would be the production of a complex of intersecting ridges as in the Brazilian highlands. If the inertia of the one should exceed that of the other, the stronger would simply be deflected and the weaker absorbed. On this theory the primitive Andean ridges were deflected in Colombia successively to the east and west by waves advancing from the north. Similarly the transverse Antillean ridge was deflected towards the south by a wave advancing from the east which was itself deflected towards the west along Florida and the Bahamas. Again the interaction of deflected Mexican waves and transverse waves produced the complex mountain-system of Guatemala and Honduras, the Sierra de Comayagua being possibly the remains of a wave with a north and south front. Moreover the great upheavals at the end of Mesozoic times were again the result of two sets of waves which were deflected in the same way as before, the Archæan ridges forming stable axes along which the mountains were folded. According to this theory the inertia of the meridional waves and the consequent mountain-building would appear to have been always greater than that of the equatorial waves in the New World, while the opposite was the rule in the Old World.

The recent volcanic disturbances in St. Vincent and Martinique are evidently connected with readjustments along the line of weakness which, as we have seen, has existed there since the beginning of Tertiary times. Dust from the Soufrière was carried on May 7 as far as Barbados against the prevailing wind, and therefore necessarily in the upper reaches of the atmosphere. The constitution of the dust gives us some interesting information about the nature of the molten rock which filled the crater. The particles are never so large as one-thirtieth of an inch, and may be readily separated into sizes by means of sieves. The largest are mostly fragments of vesicular and glassy lava, grey, brown, or red in colour, floating readily on water, and when crushed, exhibiting a few microlites of felspar. Associated with these are broken crystals of felspar, amphibole, pyroxene, and magnetite. The magnetite is very abundant, and often occurs in perfect crystals showing octahedral and dodecahedral faces. It can be readily extracted from the dust by passing a magnet through it. The felspars sometimes occur in perfect tabular crystals, but usually they are fragmentary, broken either regu-

larly along the cleavage planes or quite irregularly with a glassy fracture. Often they exhibit a peculiar pitted surface, as if they had suffered mutual attrition in the air. They frequently show zonal structure in polarised light and always exhibit the characteristic striation of plagioclase felspar. Glass cavities and inclusions of small crystals of magnetite are abundant. In specific gravity they range from labradorite to anorthite, and are therefore fairly basic soda-lime varieties. The pyroxene is of two kinds, monoclinic and rhombic. The monoclinic is green, very slightly dichroic, with a high extinction angle, and never in good crystals. The rhombic, however, is frequently idiomorphic in short stout prisms, of a reddish brown colour, strongly dichroic through yellow and green, and giving a straight extinction. Both varieties have numerous inclusions, and the rhombic is perhaps the more abundant of the two. The amphibole is very sparingly present, and is represented by a few elongated crystals of brown hornblende. All the larger particles are coated with fine dust, which is composed simply of comminuted pumice and microscopic fragments of crystals.

Taking the constitution of the dust as a fair index to that of the magma, we find that the minerals in the ash correspond exactly to the phenocrysts of the rock known as hypersthene andesite. This, then, is the rock which would have been formed if the lava had flowed out at the surface. It would have consolidated as a dark-coloured glassy rock, studded with numerous porphyritic crystals of felspar and pyroxene. It is interesting to compare the constitution of this recent dust with that from the eruption of the Soufrière in 1812. A sample of the latter, also collected in Barbados, is much finer in grain, thus indicating either a less intense explosion or weaker air currents at the time of eruption. The dust, however, is practically composed of the same minerals, with the rhombic pyroxene in greater excess. This identity in composition would therefore also be a feature of the magmas in the reservoir. The only conclusion that can be drawn from this is, that ninety years is not a sufficiently long period for the production of any extensive differentiation in the magma. It is more probable that there would be a difference in type between the products of these recent eruptions and the old basement lavas[1] which underlie all the islands of the Lesser Antilles. It may be hoped that some of the numerous scientific men who have been despatched to the spot will thoroughly investigate this interesting point. These volcanoes, as we have already seen, are entirely independent of any of the other volcanic groups in America, so that a comparison between their products is not of great value. One point brought out by such a comparison, however, is the predominance amongst recent American lavas of rocks of intermediate type as a whole, and among these, of hypersthene andesite in particular.

The accompanying illustration shows the town of St. Pierre, Martinique, before the late eruption. The background shows the slopes of Mount Pelée. We are indebted for the loan of the block to the Royal Mail Steam Packet Company, London.

[1] Of these lavas little is known. Porphyrites and greenstones are said to be common, and Zirkel mentions the occurrence of trachytes in Martinique.

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GEOGRAPHICAL NOTES.

EUROPE.

Land Ownership in France.—M. Flour de Saint-Ginis in *La Propriété rurale en France* (Paris, 1902) gives some interesting figures in regard to the division of the soil in France. He divides the proprietors into three sets : (*a*) those owning 0-6 hectares ; (*b*) those owning 6-50 hectares ; (*c*) those owning 50-200 hectares. The 49,388,304 hectares of agricultural land in France are divided among these three classes in the following proportions : (*a*) 12,754,803 ; (*b*) 19,217,902 ; (*c*) 17,415,599. The large estates—those of class (*c*)—are localised in two regions, in the central part of the basin of the Loire, Loir-et-Cher, Nièvre, Allier, Indre, and in the extreme south-east, Bouches-du-Rhône et Basses-Alpes, Var, Hautes-Alpes, Alpes-Maritimes. In all the north and west save in Loire-Inférieure, Orne, and Manche the land is mostly rented, as it is also in Côte d'Or ; in Allier and the Landes it is mostly held on the leasehold system known as *métayage* ; elsewhere it is farmed by the owners. That the condition of the rural population is improving is, according to the author, shown by the increase in the number of two-storied houses and the increase of the food bill of the rural population.—*La Géographie*, v.

Lower Course of the Petchora.—M. Novosiltsov has made a number of observations on physical geography and ethnology in the regions in the vicinity of the Petchora. The administrative centre of the region—Ust Tsylma—contains 6000 inhabitants, while the entire district with its 28,500,000 hectares only contains 33,371. At the town the banks of the river are covered by thick forests of conifers mingled sometimes with deciduous trees. Save where sheltered from the north wind, the latter do not extend beyond 67° North Latitude. A little in front of Poustozersk, the Petchora divides into a great number of branches, some of which rejoin the river, while others end in lakes. Lakes and ponds are very numerous on this part of the Petchora, the largest being Lake Poustoe, on which stands the hamlet of Poustozersk with 25 houses and 180 inhabitants. The latter trade with the Samoyedes, which traverse the region during their spring and autumnal migrations. There is also communication in the summer with Tcherdyne on the Upper Kama. Every family possesses one or two cows, which are fed on hay and the bark of the willow ; a few reindeer are also kept, and these are confided to the care of the Samoyedes in summer. The principal resource of the people is fish.

The author also spent some time in the vicinity of the Straits of Yugor. The straits are tortuous, but include a bay well sheltered from wind and ice. On the banks of the Nikolskaia, which enters the straits near the middle, is placed the hamlet of Khabarovo containing a church and four houses ; this is the commercial centre of the continental tundra and of the island of Vaigatz. Here the Samoyedes assemble in great numbers in order to trade with the Russian merchants. The Sukhoi Nos and the island Storojeva divide the straits into two portions, an eastern communicating with the Kara Sea, and a western with the Sea of Barents. The former portion has a northern aspect and never thaws, while in summer the banks of the western portion are free from snow. By the end of August the whole region is deserted, and the Samoyedes of the continent retire towards the south, and those of Vaigatz towards the interior of the island.—*La Géographie*, v.

ASIA.

Russian Expedition to Central Asia.—In the summer of 1898 the "Société Impériale des Amis des Sciences Naturelles" sent an expedition to the upper valley of the Amu-Daria, the results of which are now available. Starting from Samarkand the party reached the town of Pendjakent, and then the lake of Iskander-Kul, which has a circumference of about 10 *verstes*, and a depth of 40 metres. The temperature of the surface water is +12° C., and at 10 metres is +7·5° C. The waters of the lake fall by a cascade into the Iskander-Daria. From the lake the expedition travelled towards the valley of Hissar by Karatag; they followed the course of the Surkhob, and passed into the valley of Khingou, then into that of Vandj, which they followed till its union with the Pendj or Amu-Daria. Finally, after having explored a part of the valley of the Ak-sou, the travellers returned and descended the course of the Amu.

The valley of Kul-Kalian is placed at 3000 metres above the level of the sea, and has apparently been hollowed out by glacial action. It is surrounded on all sides by some high summits covered with snow, and its floor is covered by a chain of small basins which communicate with one another, and which at the melting of the snows are filled with water. The terminal basin has no surface outlet, but discharges its waters into a subterranean channel which gives birth to the stream named Turuch-Daria. The whole region visited by the expedition is a part of the western slope of the Pamirs, and is traversed by numerous rivers occupying valleys separated by high crests, and draining into the Amu-Daria. In former years the valleys formed independent principalities which have been annexed, some by Bokhara and some by Afghanistan. The inhabitants are Tadjiks, and formerly in all probability this race occupied the whole of the district on the right bank of the Amu, and like the ancient Persians its members were fire-worshippers. Within historic times the advent of the Turks from the north and the Arabs from the south has limited the range of the race, until it is now confined to the high valleys of the right affluents of the Amu.—*La Géographie*, v.

Boat-Building among the Malays.—Mr. H. Warington Smyth in the *Journal of the Society of Arts* traces in a very interesting way the relation between the conditions of navigation in the Malay Peninsula and the character of the boats built by the inhabitants. The latter are essentially a maritime people, and yet they have never succeeded in developing a really efficient seagoing boat, the native boats being essentially canoes, whatever their modification of form. The fact can however be explained by the physical conditions of the region. The tides are very strong, the winds light and variable; in consequence Malay seamen must always depend primarily on paddles or oars, the lot of a sailing-vessel being too precarious to make sails more than an occasional convenience. Again, the rivers are protected by very shallow bars of sand or mud, so that it is impossible for any but boats of light draft to enter them. This has led to the production of the characteristically shallow boats and to a consequent lack of stability.

AFRICA.

Exploration in Southern Madagascar.—M. Guillaume Grandidier has recently succeeded in journeying from Tuléar to Fort Dauphin *viâ* Cape Sainte Marie, through hitherto almost unknown districts. The dense forest of Eastern Madagascar extends as far as Fort Dauphin, and in its recesses lurk warrior races still hostile to French rule. On leaving Fort Dauphin the traveller passes into a

vast calcareous plateau, with a mean altitude of 120 to 150 metres, which is relatively flat, but is fissured towards the north by the valley of Onilahy : this valley forms the ethnic boundary of the region to the north. In the latitude of Tuléar the northern border is marked by some dykes of primitive rocks. Near Egedèda some hillocks of red quartz form the western boundary, and at this side the plateau falls perpendicularly down to a narrow band of sand, traversed by basins dried up or filled with salt water. To the south the plateau abuts on the sea, while eastwards it is bounded by the ramifications of a volcanic *massif*, and by the valleys of some streams which have hollowed out the calcareous soil. The plateau constitutes the country of the Antandroy and the Mahafaly, and, owing to the permeable and calcareous soil, is devoid of water, the three rivers which traverse it being dry for a great part of the year. Indeed, their waters reach the sea only in flood-time. The inhabitants are in consequence constrained to collect in gourds the water found after the rains in the crevices of the rocks, and at other times have to depend upon the brackish water obtained from wells sunk in the lagoon at the foot of the plateau, or in the bottom of the dried-up streams.

All the plants of the region are xerophytes, adapted to the conditions of almost constant drought ; aloes and species of cactus are abundant, and form dense hedges round the villages ; rubber-plants also occur, but more sparingly, and numerous huge specimens of the baobab mingled with other trees give the region its characteristic facies. The fauna is less abundant than the flora. A few lemuroids, a small rat, some birds, and a giant tortoise are the most conspicuous. Sheep and oxen are domesticated and constitute the chief source of wealth of the inhabitants. The population is large and the people warlike ; they are of Indo-Melanesian origin, and, owing to the absence of communication with other races, form an almost pure stock. Though naturally of good physique they are pale and emaciated owing to the wretched diet—chiefly stems and fruits of cactus. Agriculture is virtually unknown, and there are practically no arts or manufactures. Ordinarily the people rarely eat meat, but during funeral ceremonies many cattle are killed and an enormous amount of beef and rum consumed.—*Revue Scientifique*, 20.

German Expedition to Lake Chad.—This expedition has now returned to Kribi in the Cameroons Colony. About eighteen months ago it left this place for Lake Chad, reaching Kribi again about April 18. There were five white officers in the party, one of whom died of fever during the journey ; no fighting with hostile tribes occurred during the journey from the lake to the coast, and the party arrived in good health.

During the month of July a new German expedition will start from the West African coast for Lake Chad. It will be of a scientific nature, and will be undertaken for the purpose of ascertaining the commercial value of the products of the German side of the lake. It is expected that the expedition will embark on a steamer at Brass on July 20, and thence proceed up the Niger as far as the Binué. Brass is one of the oil rivers of the British settlement of Southern Nigeria, and the expedition will be in British waters until it reaches Garcia which is several hundred miles up the Binué, and is on the boundary line between English and German territories. Beyond Yola the expedition will strike overland. This route will greatly shorten the distance to Lake Chad as compared with the long overland journey from the German colony of the Cameroons.

AMERICA.

Earthquakes in Guatemala.—Associated apparently with the volcanic disturbances in the West Indies there have been very serious earth movements in Central America. In time these tremors preceded the West Indian eruptions, for they lasted from April 8 to April 24. In Guatemala the damage done was serious, some eight cities having been destroyed, including Quesaltenango, a city only second in importance to the capital.

AUSTRALASIA.

Return of Prof. Baldwin Spencer.—On March 17 last Prof. Baldwin Spencer and Mr. J. F. Gillen returned to Melbourne from their expedition to the northern interior of Australia. They arrived in excellent health, and have obtained a considerable amount of material, including phonograph and kinematograph records, in regard to the aboriginals of the interior, and hope to publish an extensive work on the myths and customs of the tribes studied.—*Victorian Naturalist.*

British New Guinea.—At the April meeting of the Royal Geographical Society of Queensland, Mr. H. R. Maguire presented a paper on his impressions of British New Guinea after a year's stay in the territory. Mr. Maguire considers that the island is destined to become exceedingly prosperous, for it has a regular rainfall, fine rivers and numbers of excellent natural harbours. If cable connection and a regular fortnightly mail service were established between the Possession and Australia, there is reason to believe that immigration on a large scale would follow. In many parts of the Possession indigenous rubber-trees are numerous, and the rubber industry only requires development. Though there is relatively little pastoral country, that which does exist produces splendid grass and is well watered. In the northern division thousands of acres along the rivers are available for purposes of agriculture, while only the fringe of the gold-bearing country has been tapped. The author also pointed out some modifications in the government of the Possession which he believed necessary for its full development, and dwelt on the necessity for the removal of the seat of Government from Port Moresby to a more eastern and therefore more central locality.—*Brisbane Courier.*

Exploration in the New Hebrides.—In *La Géographie*, v., some account is given of the chief results obtained by the French expedition to Espiritu-Santo, as detailed by M. J. Ollivier. Espiritu-Santo is the largest island of the archipelago, having a superficies estimated at 3786 square kilometres. All the western part of the island from Cape Lisburn to Cape Cumberland is occupied by a mountainous relief rising steeply from the margin of the sea, and sloping gently downwards on the eastern side. The usual height is 600-800 metres, but some peaks exceed 1000 metres. Towards the north-east a series of plateaux crosses the island obliquely, while another plateau-zone borders the eastern coast. The high ground is formed chiefly of eruptive rocks, but towards the east sedimentary rocks abut against these, elsewhere coral rocks predominate, and occur up to heights of 400 metres The climate is tropical; the eastern slope of the littoral range receives the south-east trades, and has an annual rainfall of two metres, but the other slope is dry, and here the vegetation is consequently stunted and sparse. Elsewhere the country is well wooded and the flora rich. The region best fitted for agriculture lies towards

the south, some 45,000 hectares being fit for cultivation. In the plains and valleys cocoa plantations flourish well, while certain of the plateau regions are suitable for Arabian coffee (*C. arabica*), and *C. liberica* thrives at lower levels.

POLAR.

Expedition to Spitzbergen.—On July 26 a Swedish expedition for taking meridian measurements will leave Tromsö for the seven islands to the north of Spitzbergen. It will be under the leadership of Dr. P. Rubin, and will include Dr. von Zeipel as astronomer, and Lieut. Duner as cartographer. The return to Tromsö will take place on July 26.

Baldwin-Ziegler Auxiliary Expedition.—The plans for this expedition have been completed, and the members of the expedition have left America for Europe. The steamer *Frithjof*, which with the *America* conveyed Baldwin's party to Franz Josef Land, will depart from Tromsö on July 1. The auxiliary expedition will be in charge of Mr. W. S. Champ, secretary to Mr. William Ziegler, who sailed to Europe on the ss. *Cymric* on May 23, while the remainder of the party left by the ss. *Pretoria* on June 7.—*Science*, xv.

Scottish National Antarctic Expedition.—Good progress has been made with the dismantling and reconstruction of the *Hekla*, which has been lying at Troon since March last. The reconstruction is to be so thorough that practically nothing but the hull remains of the original ship, and even this is being largely renewed. The iron framework for the new deck-house is in position, but it is expected that some time must elapse before the work is completed.

German South Polar Expedition.—We have received a postcard from Professor Erich von Drygalski, under date of January 1, announcing the safe arrival of the *Gauss* at Kerguelen. In the words of Professor Drygalski—"Aller geht gut." As is noted in *Nature*, the *Gauss* would probably enter the Antarctic ice at much the same time as the *Discovery* and the Swedish ship. Professor Drygalski's intention was to enter the ice at the point of Termination Island, with the object of ascertaining the connection, if any, of Victoria Land and Kemp and Enderby Lands. He hopes to be able to sweep westwards, and ultimately emerge by way of South Georgia into the South Atlantic.

GENERAL.

Summer Courses at Cambridge and Oxford.—Among the many courses which are to be given during the Cambridge Meeting between August 1 and 26, some are of special interest to teachers of Geography. Mr. Yule Oldham, M.A., the University Reader in Geography, will give a series of demonstrations and practical exercises in *Geography in its Physical Aspects* specially for teachers. The excursions will include one to the Bedford level for the demonstration of the curvature of the Earth's surface.

In junior classes in schools it is not desirable to distinguish between the different branches of science, and we are glad to see that a special course of six lectures on *Nature Study* by Professor Patrick Geddes has been arranged for the second part of the Meeting, supplemented by three illustrative lessons by Miss Von Wyss, Lecturer at the Cambridge Training College for Women, and a course of practical work supervised by Messrs. Wood, Adel, Biffen, and Yule Oldham. Geographers will listen with interest to Dr. R. D. Roberts's lectures on *An Aspect of the Influence of America on Geology*, and to Mr. W. N. Shaw, the "Clerk of the

Weather," on *Meteorology in the Nineteenth Century* in the first part of the Meeting; and to Mr. J. E. Marr's account of *Modern Views on the Structure of the Earth's Crust* and on the *Evolution of the Configuration of the Surface* in the second part. A number of other lectures will attract them, such as those on *Russian Development of To-Day*, by Professor Vinogradoff of Moscow; *The Expansion of the United States*, by Mr. Borden of Cornell University; *Problems of the Far East*, by Mr. Hannah, late of Tientsin; *Problems of the Near East*, by Mr. Gooch; *England's Commercial Struggle with Napoleon*, by Mr. Holland Rose. There are also numerous lectures on educational subjects.

At Oxford the Long Vacation course in geography will be primarily suited for teachers, but as it will be mainly devoted to the generalisations concerning the Earth as a whole which form the basis of modern geography, it may also be useful to others whose work has geographical aspects.

The course will extend over three weeks, beginning on Tuesday evening, July 29, and ending on Tuesday, August 19. Lectures and laboratory instruction will be given at the School in the Old Ashmolean Building, Broad Street, daily, from 9 a.m. to 1 p.m., except on Wednesdays, when the whole day will be devoted to surveying and drawing sketch-maps in the field. After the conclusion of the course an excursion, which may extend over two or more days, will be arranged to places of special geographical interest. Certificates of attendance will be granted to those who carry out the full course.

Economic Value of the Bamboo.—M. Charles Rivière gives in the *Revue de Géographie* an interesting account of the bamboos, these giant grasses which mean so much to the inhabitants of tropical and sub-tropical regions. Widely distributed over the warmer regions of the globe, the majority of the individual species have nevertheless a very restricted range, each country having often its own form. The only cosmopolitan form is *Bambusa vulgaris*, and this has been carried over the globe by man. The veneration paid by many peoples to the plant is easily understood when it is realised that not only does it form the basis of most of the arts and manufactures of the regions in which it occurs, and yield weapons of war and of the chase, but there is something almost miraculous in the rapidity of growth. Flowering is in most cases rare, but, when it does take place, occurs simultaneously in all the members of a grove, and is followed by the death of the plants. The physical conditions necessary to produce flowers are inadequately understood, but drought seems to be included among them. In consequence it sometimes happens that the bamboos, in consonance with their sacred character, save the peoples of their vicinity from famine, for their rare flowers set into grain-like fruits, which, appearing when drought has engendered scarcity, form a valuable addition to the food stores of the district.

It would be impossible to detail all the uses to which the inhabitants of Asia especially put the bamboo, but it may be noticed that the direction which the art of China and Japan has taken has been largely determined by the physical properties of the bamboo. Apart from the manifold uses to which its wood is put, it gives employment to a large population in the manufacture of paper from which fans and parasols are made. The young shoots form in many regions an important part of the food-supply of the race, and we have already mentioned the fruits. It is thus obvious that the bamboo is a plant of supreme importance for tropical and warm countries, and therefore is specially worth the attention of colonial governors, notably in Africa, where bamboos do not appear to be well represented, and where it is necessary to introduce the more useful Asiatic species.

Anniversary Meeting of the Royal Geographical Society.—This meeting was held on May 26, when the medals and awards were distributed. In his opening address the President, Sir Clements Markham, spoke of Polar exploration generally, and especially of the Antarctic Expedition. No news can be expected from Captain Scott till the spring of next year, but no difficulty is expected by the members of the relief expedition in finding the *Discovery*, if she winters in Wood Bay or in any part of the coast between that and Cape Crozier. Of the £22,000, which is the minimum required for the relief ship, about £20,000 has been already subscribed, and the ship is expected to start at the beginning of July. Sir Clements also spoke of the Arctic expeditions at present at work. The *Windward* will bring back the members of the Peary expedition from Smith Sound; of Captain Sverdrup and the *Fram* nothing has been heard; while two other northern expeditions are Mr. Baldwin's and Baron Toll's.

Antwerp Geographical Exhibition.—The response to the circular in regard to this exhibition which was sent out by the Antwerp Geographical Society has been so hearty that the exhibition has become almost international in character. We noticed the original plan of the exhibition in our March number; the ethnological section proves to be very important, having received many contributions from the Belgian Government. The exhibition is lodged in the winter palace of the Antwerp Zoological Society, and was opened on Thursday, May 29. It will remain open for about six weeks.

Reports of Cambridge Anthropological Expedition to Torres Strait.—In vol. ii. of these reports Mr. W. H. R. Rivers discusses in Part i. (*Introduction and Vision.* Cambridge: The University Press, 1901) some points in regard to the eyesight of Papuans, which was so far as possible carefully tested during the expedition. He finds that the balance of evidence is distinctly in favour of the common belief of the superiority of native vision, but the difference seems to be psychological rather than physiological. The native concentrates his attention on relatively few objects in his environment, and is able to recognise these at a much greater distance than civilised man, whose objects of interest are more numerous. Where a European has the opportunity to acquire an equal familiarity with a limited number of objects, his range of vision similarly increases. The women at Torres Strait have as good vision as the men, the decline of vision begins earlier than with civilised man, and the natives generally do not display the rapid improvement with a given test which is a common feature among Europeans. Myopia is less common than with Europeans, and the natives apparently see better with a feeble illumination. In regard to colour blindness, the form which consists in a confusion of greens and reds (the typical European form) is practically absent, but the natives showed themselves somewhat insensitive to blue and green. An interesting point is that illusions which depend upon interpretative factors are less marked than with Europeans, while those which depend upon the physiological peculiarities of the eye are more marked. It would seem that the difference in the power of vision of civilised and uncivilised races lies chiefly in the fact that the former are concerned mainly with the larger relations of natural objects, and the latter with the minute observation of a few details. This latter form of excellence seems to be prejudicial to the due interpretation of sensory experience, for "if too much energy is expended on the sensory foundations, it is natural that the intellectual superstructure should suffer." Another consequence is that the native mind has less æsthetic interest in nature than the civilised mind.

Sea Temperature and Shore Climate.—In a short article in *Nature*, attention is drawn to the fact that old as is the belief that the sea has a modifying effect on the climate of the adjacent land, detailed investigations as to the nature of the relation are scanty. The Meteorological Council has recently made a new departure in the matter, and by means of the co-operation of the officers of the Mercantile Marine has been able to obtain daily records of sea temperature during voyages across the North Atlantic and to the Mediterranean. The results so far obtained have been published on the monthly pilot charts, and are of a very interesting nature, but a consecutive series showing the variations month by month on sea and land is required before it is possible to draw any conclusions as to the effect—direct or indirect—of sea upon air temperatures. The author of the article appeals for a weekly publication of results instead of a monthly one, when these become numerous enough to render this possible.

New Geographical Society.—We have received a copy of the Constitution and Bylaws of the *Societa Geografica Maltese*, a society founded on the 15th of May last for the scientific study of geography. The first volume of the Transactions will appear in February 1903. All publications will appear in Italian, but English will also be allowed at the meetings of the Society. The present society is the successor to one which was founded in the eighties but subsequently lapsed.

New Bibliographical Journal.—We have received the first two numbers of the *Bulletin Bibliographique Colonial*, a new journal published by the *Union Coloniale Française*, and just added to our list of exchanges. The object of the new enterprise is to render available to students and others the material published in France and elsewhere on colonial questions. This is accomplished by noting not only all books dealing with colonial affairs, but also giving brief summaries of any articles on such subjects which may appear in periodicals, articles whose contents might otherwise escape notice. The *Bulletin* is to appear every two months, and is sold at the price of one franc per number. So far as may be judged from the first two numbers it is likely to be exceedingly useful, and is well arranged.

COMMERCIAL GEOGRAPHY.

Trade of Abyssinia.—A *Times* correspondent draws attention to the railway now in process of construction from the French port of Jibuti to the inland town of Harar, and the probable effect of this on the trade of the British port of Zeila. The two ports have been trade rivals for some time, but Zeila is handicapped by the natural disadvantages of its situation. Harar is a town of about 30,000 inhabitants and is placed 6000 ft. above sea-level. The climate is fine and bracing, the surrounding country fertile and capable of growing almost anything, and the town only requires a railway to make it an important commercial centre. The effect of the completion of the railway will be to put all this trade into French hands. It is impossible that under the conditions Zeila can permanently compete with Jibuti, but if the prosperity of British Somaliland is to be preserved, a railway should be constructed from Berbera to Harar. The distance is about the same as from Jibuti to Harar, and Berbera is a fine port, while the railway could be arranged so as to tap many fertile districts on its path. Such a railway could be constructed at an outlay of about half a million, and would possess much political as well as commercial significance.

The Fisheries of Tunis.—In the *Revue Générale des Sciences*, one of our new exchanges, there is a brief but important article on the above subject, and on the

necessity for immediate legislation in regard to certain of the fisheries. In Tunis some 60,000 persons depend for their livelihood upon fishing, and in the port of Sfax especially the industry is a very important one. In 1900 no less than 1271 boats were employed in the sponge fishery, and the produce included 85,597 kilogrammes of bath sponges and 10,364 kilogrammes of the coarser varieties, the total value being 1,534,845 francs. In spite of the importance of the industry it is quite unregulated, no close time is observed, and one of the instruments employed —a dredge known as a "gangave," is of exceedingly destructive nature, for it tears up and destroys a vast number of young sponges which have no commercial value.

In the Gulf of Cabes the pearl oyster has been proved to exist, and the edible oyster is found all round the coast. Cuttles are the object of an extensive fishery, and after being dried in the sun are exported to Greece, where they constitute a very important article of diet during the two fasts of the Greek Church. On the northern coasts the sardine is extensively fished, in the Lake of Bizerte it is chiefly gilthead and mullet which are taken, and in the vicinity of Cape Bon and at Monastis large tunny fisheries are carried on, the produce being mostly preserved in oil.

Railways in Venezuela.—Two American companies have obtained from the Government of Venezuela concessions for the construction of two lines of railway. The first will extend from some point on Lake Maracaibo to Carora with a possible extension to Barquisemeto, and has to be completed in seven years. The second line will extend from Barranquitos to the plains of San Igacion in the district of Perija on the Colombian frontier. This district is believed to be extremely rich in minerals and in valuable woods. The capital necessary for the construction of the lines is to be supplied by the Americans of Maracaibo, and it is expected that they will lead to the opening up of much of the country.—*Bulletin d. l. Société d'Études Coloniales*, ix.

New Swiss Railway.—There is some possibility that Switzerland may add a new item to its list of engineering triumphs by a railway line through the Bernese Oberland. The suggested line would start from Berne, pierce the Lötschberg by a tunnel, and rejoin the Simplon line at the north entrance of the tunnel. There would be several tunnels with a total length of 24 kilometres, the longest having a length of 13½ kilometres. The result would be to afford more direct means of communication between North-East France, Belgium, Holland, and the German basin of the Rhine on the one hand and the Italian peninsula on the other than is at present afforded by the St. Gothard and Mont Cenis route.—*Le Mouvement Géographique.*

NEW BOOKS.

GENERAL.

The Dawn of Modern Geography. By C. Raymond Beazley, M.A., F.R.G.S. Part I. pp. 538, with 11 illustrations and 17 ancient plans and maps. Part II. pp. 650, with 16 ancient maps. London: John Murray, 1901. *Price* 18s.

It is impossible in a few lines to give an adequate account of these two volumes, which embody the results of immense reading, industry, and research. All that can be done is to give a brief inventory of their contents. To quote his

own words, the learned author gives "a history of exploration and geographical science from the conversion of the Roman Empire to the middle of the thirteenth century, with an account of the achievements and writings of the early Christian, Arab, and Chinese travellers and students. Yet, perhaps, after the perusal of Part I., which brings us down to A.D. 900, some might be inclined to think that a more correct title for it would have been "the eclipse and progressive decline of geographical science in Europe." For it is in fact for the most part a record of the decline and fall of geographical knowledge, coincident with the spread of Christianity and of the obscurantism begotten of the fallacy that the Bible is a complete encyclopædia of scientific knowledge, divinely inspired. Any genuine attempts made with the purpose of increasing our knowledge of the earth's surface and its inhabitants up to the end of the ninth century are due to the Arabs. For though the discovery of Iceland and Greenland by the Norsemen occurred before the end of the ninth century, this is first mentioned in Part II.

Part I. consists of a long introductory chapter, followed by six others. Chapters ii.-iv. are absorbed by records of pilgrimages to the Holy Land. The earliest of these is the itinerary of the pilgrim of Bordeaux in 333. Till he reaches his destination it is little more than a bare list of the towns he passed through in going and coming. Still it is interesting as suggesting a possible route by which the earliest bronze may have been brought from the Eastern Ægean to Hungary and North Italy before other parts of Europe. The first lady pilgrim to leave an interesting narrative of her pilgrimage and wanderings in the East, about the year 380, was Silvia of Aquitaine. She seems to have gone to Egypt by sea and then found her way to the Sinaitic Peninsula, where she made the ascent of Mount Sinai, and describes the splendid view from the top. On another occasion she rode on a donkey nearly to the summit of Mount Nebo, finished the ascent on foot, and was enchanted with the panorama that she there beheld. Later on she travelled to Edessa and Haran to the limits of the Roman Empire, a distance of 2000 miles from her native home. Chapter v. is devoted to commercial and missionary travel; chapter vi. to geographical theory. Solinus Polyhistor about A.D. 230-40 brought together that body of travellers' tales, for the most part borrowed from Pliny, which became the standard of geographical myth from the fourth to the fourteenth century. The Anonymous of Ravenna, about A.D. 650, was not more original, as his tables and introduction are in the main abstracts or adaptations from the works of older pre-Christian writers. Two centuries later Guido of Ravenna compiled a geographical work on Italy and the Mediterranean, which was again simply copied without acknowledgment from the Anonymous of Ravenna. Dicuil, an Irishman of very wide reading for his time, who lived in the ninth century, records the discovery of Iceland for the first time by Irish hermits in 795. He also confuted the absurd fable of Solinus that no elephant can lie down. Chapter vii. treats of non-Christian geography of the early middle ages. The Arabs probably traded with Canton as early as A.D. 700, and continued to do so for more than a century. Even before this date they were probably established in Ceylon with trading colonies all up the Malabar coast. The Arabs founded an observatory at Bagdad in 820, and soon attempted to determine the obliquity of the ecliptic. About 860 Sallam was directed by the Caliph to explore various regions north of the Mussulman Empire. He passed through Georgia, crossed the Caucasus, visited the lower Volga, made the circuit of the Caspian, explored a large part of the Ural and Altai mountains, and returned by Bokhara and Khorasan. In other works of Arab authors the habits, customs, religion, and government of the Chinese and Indians are described in considerable detail. Some of their writers on geography, such as Massudi, were great travellers, and traversed

many countries from the extreme east of Asia to Spain. As travellers the Chinese paid little heed to geography, hence it is very difficult to trace their exact routes to India. The kingdom of Fu-sang became known to them about the year 499. Some have thought it was California, while others have supposed it to be Japan. A thousand *li* east of Fu-sang was "the Kingdom of women" and seven thousand *li* north-east of Japan was "the Land of marked bodies," the discovery of which is placed between A.D. 502-556. The inhabitants of this country point, in the author's opinion, to the American Indians, and he seems to believe that, if not at this particular period, at any rate at an early date, the Chinese had discovered America.

In Part II. the first short chapter is introductory. The next is on the "Norsemen in the history of exploration to the beginning of the Crusades (*c.* A.D. 800-1070)." The Norse discoveries are the chief victories of European travel between the time of Constantine and the Crusades. It is fairly certain that about A.D. 1000 they had reached at least as far as the north-east coast of New England. The part of America visited by the Norsemen cannot be much south of lat. 41° N. or further north than lat. 49° 55'. The author's belief is that, from various indications given by the Sagas, Mount Hope Bay in Massachusetts in lat. 41° 24' 10" is a very likely spot to have been visited and partly occupied by the Scandinavians. Chapter iii. is devoted to "Pilgrim travel." Chapter iv. tells of "Benjamin of Tudela and other Jewish travellers to the middle of the thirteenth century." Chapter v. is headed, "Diplomatic and Missionary travel of the thirteenth century, Carpini, Rubruquis, etc." In 1245 Carpini was intrusted with letters from the Pope to the great Khan of the Mongols. This involved a journey, accompanied by the greatest privations, to Karakorum, on the Orkhon, a place which has recently come into prominence from the discovery there of early Turkish inscriptions in a script previously known to exist on the upper Yenisei. Rubruquis followed him also to Karakorum in 1252, and his narrative is one of the best records of travel in the Middle Ages. He knew Arabic, and in the course of his travels managed to pick up a fair knowledge of Mongolian. The service he rendered to geography is very considerable. But Carpini's account of Tatar manners, customs, and history is beyond comparison superior, though less geographical. Another less-known traveller was King Haiton of Little Armenia, who visited the great Khan on the upper Irtish, and returned home by Urumtsi, Talas, across the Oxus and the south of the Caspian. The next chapter is devoted to commercial travel from 900-1260. It gives a concise history of the rise and fall of Amalfi, Venice, Genoa, Pisa, Montpellier, and Barcelona, each of which played a certain part in developing commerce in the Mediterranean and the Levant. The last chapter is on "geographical theory and description (*c.* A.D. 900-1260)." During this period practical exploration steadily advanced, and theoretical geography shows unmistakable progress. Three examples are given in proof of this statement: the manual of Porphyrogennetos (911-959) "On the administration of the Empire," "The history of the church of Hamburg," by Adam of Bremen (*ob.* 1076), and the chief maps of the tenth, eleventh, twelfth, and earlier thirteenth centuries. All these authorities are fully discussed, and at last we perceive that, after a torpor of many centuries, a new era has begun. The maps of Mathew Paris of St. Albans in the middle of the thirteenth century, though improvements on those of Cosmas and Beatus, are greatly inferior to those of Ptolemy. Even in his best map, that of Great Britain, he makes the Thames fall due south into the English Channel, with Thanet as a true island in front of its mouth; Somerset and Dorset are transposed; the Clyde is made to fall into the Solway Firth, and the Firth of Forth is prolonged westwards till it meets the western ocean, and the whole of Scotland north of Fife, including the

Orkneys, is twisted round to the east. It would have been interesting to compare these maps with the *portolani* or compass charts, based on coast surveys, which were being used by the Catalan and Italian sailing-masters at this period. But unfortunately no examples are given. These volumes contain many valuable footnotes, and one might have been added in Part I. p. 436 to explain that the *Rus* of Ibn Fozlan, translated Russians, were most probably Scandinavians, the Arab name for Russians being Saklabiye. And in Part II. pp. 31, 32, for "Finns" we ought to read "Lapps," as to a Norseman Finn = Lapp and Qvæn = Finn.

Geschichte der Moränenkunde. Von Dr. August Böhm Edlen von Böhmersheim. Abhandl. der k. k. geograph. Gesellschaft in Wien: III. Bd., 1901, No. 4. Pp. 334.

In this learned work the author's ostensible object is to trace the development of our knowledge of moraines –those heaps and sheets of rock-debris which, as every one knows, are associated with glaciers. It is with the morainic accumulations now in course of formation, however, rather than with those of the Ice Age, that he is concerned. To accomplish his purpose in a thorough manner he has obviously spared no pains –the whole literature of the subject having been ransacked. No writer of the least importance appears to have been overlooked. Indeed, not a few of those cited are hardly deserving of the notice they obtain—seeing that they often merely repeat a thrice-told tale. It is gratifying, however, to note that, amongst those long passed away, all who have made important original observations are still not infrequently referred to in current glacial literature. If some worthies have been forgotten, it is just because they did little to increase the general stock of knowledge. Dr. von Böhm begins his critical survey and review with a notice of the earliest description of a glacier– that, namely, given in Sebastian Münster's *Cosmographia* (1554). Diligently pursuing the history of "moraine-knowledge," he brings us at last down to the year 1840—the blooming-time, as he remarks, of glacial research. Up to this point the author has proceeded with due serenity –at once interesting and informing his readers. Nor is his *résumé* of the views held by Godeffroy, Rendu, Agassiz, Charpentier, Forbes, and their contemporaries less able and instructive. So long, indeed, as he deals with authors beyond the reach of criticism he is sympathetic and fair-minded. But unfortunately we cannot say the same of his treatment of eminent men who are happily still with us. The mere mention of a certain well-known and much-respected Professor of Geography has the same effect on our perfervid author as the proverbial red cloth has on a bull. A phlegmatic Britisher cannot sympathise with such constant nagging and querulous fault-finding. We fear, moreover, that the author's hypercriticisms are not always conspicuous for their good taste: and he often wearies or irritates his reader with long-winded logomachies. It is much to be regretted that a man of science, so conspicuously able and accomplished as Dr. von Böhm, should waste his time and energy on hair-splitting disputations about mere trifles. By so doing he runs the risk of damaging his own rather than his *bête noire's* reputation. When the reader gets so far as page 218 of the work before us, he will be amused to find that the preceding elaborate history of "moraine-knowledge," with its exhaustive bibliographical research and caustic commentary, is, after all, only an introduction to a sharply critical review of the Report of the International Glacier Commission which met in Switzerland during the autumn of 1899. This association of inoffensive gentlemen, regretting the fact that much confusion reigns in the matter of glacial terminology, thought that this might be obviated or reduced if they could arrange, for general use, some

scheme of classification and nomenclature. It is one thing, however, to frame such a scheme—it is quite another matter to get it adopted. The Commission, comprising as it did a number of highly competent authorities—men of world-wide reputation—might have been expected to do a good bit of work, however, and this expectation, as we think, has not been disappointed. No one, we suppose—not even the members of the Commission themselves—will contend that their scheme is perfect; but it can be readily improved with increasing experience. To us it seems to be at once simple and comprehensive—not going into too much detail, but noting only the more prominent and important types of moraine. The names are given in German, French, and English, and are all perfectly clear and intelligible. The English terms are not always a verbal translation, but (*pace* Dr. von Böhm) they are quite correct, and signify exactly what the Commission intended that they should. To classification and nomenclature alike, however, our author objects with characteristic vehemence. One who did not know better might be led to suppose, from the tone of his attack on the Commission, that the worthy glacialists in question were incompetent tiros, ignorant of much which, in point of fact, is more or less matter of common knowledge. It is needless to say that Dr. von Böhm does not intend to convey any such impression. He is well aware that Professors Heim, Richter, Penck, and Brückner—all members of the Commission which has roused his ire—are masters in the domain of glacial research. But he is nevertheless quite clear that they have bungled the job in hand, and that he himself can do much better. "Viel' Köpf', viel' Sinn'!" he exclaims, and flouts the Commissioners by telling them that their classification is merely a compromise between their own individually conflicting views. If it comes to that, however, every classification and system of nomenclature which would command general acceptance must be of the nature of a compromise. The terminology that may be entirely agreeable to one expert is not likely to commend itself *in toto* to all other equally well-informed and competent judges. We confess that we have not that craving for neologisms which is so much the vogue nowadays. It is a pity, as a rule, that the man who coins a new name for a thing or a conception known and designated probably before he was born, cannot be compelled to eat his word and apologise for its appearance. The senseless multiplication of new terms for old ones is productive of far more confusion and misapprehension than the persistence of the old ones, however inadequate, could possibly be. Not the least point in favour of the Glacier Commission's Report is the creditable fact that its sins of word-minting are inconspicuous—almost all the terms employed having been known in glacial literature for many years. But, as we have mentioned, their scheme finds no favour in Dr. von Böhm's eyes. Unfortunately for himself, however, he does not confine himself to iconoclasm, but is rash enough to submit a novel classification and a set of terms, many of which are brand-new coinages of his own, and in this respect, if in no other, are from our point of view superfluous. He is satisfied, however, as to the superiority of his scheme and terminology, and apparently expects that they will be generally adopted, for he is at pains to supplement his freshly minted German names with their supposed equivalents in French, English, Italian, Dano-Norwegian, and Swedish. We fear, however, that many of these equivalents will be more or less incomprehensible to his foreign fellow-workers. Where is the English reader, for example, who will understand what the following terms mean:—*wandering moraines*, *sieve moraines*, *veined moraines*, *interjunction moraines*, *sole moraines*, *staple moraines*, *flat shrink moraines*, etc.? The individual words are no doubt English, but their collocation is unintelligible. "Wandering moraines" might just as well be dancing moraines, and "sieve moraines" pepper-

dredger moraines, for all the meaning the terms convey. Enough, however, of fault-finding! Notwithstanding the blemishes we have indicated, Dr. von Böhm's work is a valuable addition to glacial literature, and must claim the attention of all who are interested in the subject of which it treats.

ASIA.

Preliminary Report on a Journey of Archæological and Topographical Exploration in Chinese Turkestan. By M. A. Stein, Indian Educational Service. Published under the authority of H.M.'s Secretary of State for India in Council, 1901. Pp. 77. 16 Plates.

The monograph now before us is only the preliminary report of Mr. Stein's expedition to Chinese Turkestan; nevertheless we can gather from it that the expedition has been crowned with brilliant success, and that the detailed report, which must necessarily be a work of time, will be full of interest to geographers, numismatists, archæologists, etc. Starting from Srinagar, in Cashmere, in the end of May 1900, Mr. Stein marched through Gilgit and Hunza over the Kilik Pass into Chinese territory on the Taghdumbash Pamir, where he began his plane-table survey and systematic triangulation by theodolite. He visited the head of the Ab-i-Panga valley near the glaciers, from whence the Oxus issues. Thence he passed on to Tashkurghan, for which, as an historical site, he claims greater antiquity even than that implied by the notices of Sungyun and Hiuen-Tsiang. From here he proceeded with the survey of the Muztagh-Ata range, and on to Kashgar, where he made the final arrangements for his journey to Khotan, choosing the southern edge of the great desert for his line of route as "There was to be found clear evidence that all along we were following the same great thoroughfare by which in earlier times the trade from the Oxus region and the Far West passed to Khotan and to China." He reached Khotan in October, and spent nearly a month in completing the survey of the Kuen-luen range and the triangulation of the Khotan mountains. He was allowed to enter the Kohmari cave or grotto, identical with the Mount Gosrnga of Hiuen-Tsiang, from which MM. Grenard and Dutreuil de Rhins had received certain birch-bark leaves of manuscript, of the genuineness of which Mr. Stein has doubts. Thence he proceeded to explore some of the old sites of ruined cities referred to by Dr. Sven Hedin in his address to this Society in December 1897 (*vide* vol. xiv. page 30), and he confirms the opinion of M. Grenard that the modern Yotkan is the site of the ancient capital of Khotan. His excavations in Yotkan resulted in rich finds of pottery, images, coins, and seals. He proceeded to Dandan-Uiliq, which he identified as "the ancient city of Taklamakan" of Dr. Sven Hedin. The excavations here disclosed even richer treasures than those of Yotkan, viz., statues, frescoes, inscriptions, painted tablets, and manuscripts in Sanscrit and Brahmi and Chinese characters. Working on to what he calls the Niya river site, Mr. Stein resumed excavations and found hundreds of inscribed wooden tablets in Kharishto writing—handsomely carved household furniture, walls with carefully executed frescoes of lotus garlands, and a piece of a coloured rug resembling an Indian Durrie. An old rubbish-heap rewarded the excavator with over two hundred documents in Kharoshti and Chinese in wood and leather. A pen of tamarisk wood was found, and cases, not unlike our common leather cigar-cases, were secured unopened and presumably containing very interesting documents. At Endere manuscripts were found in Brahmi writing, but the text in a non-Indian language, also a manuscript in Tibetan, treating of Buddhist metaphysics. In a ruined stupa at Rawak no less than ninety-one colossal relievos were found, showing some similarity or affinity to the Græco-Buddhist sculptures of the

Peshawar valley. Not the least service performed by Mr. Stein to archæology is his complete exposure of the "treasure-seeker," Islam Akhun, who, finding that "old books" were much in demand in India, started a large manufactory of them from wooden blocks with most satisfactory pecuniary results to himself and his staff, for his "old books" are now to be "found in public collections in St. Petersburg, London, and Paris, and also in private hands." But enough has been said to indicate how interesting this monograph is, and that the detailed report cannot fail to be a most welcome and valuable addition to our stock of knowledge of the geography and archæology of Chinese Turkestan.

BOOKS RECEIVED.

We have received the following new books, which will be reviewed in due course:—

Pioneering in New Guinea. By J. Chalmers. London: Religious Tract Society. New Edition; no date. Ex. Crown 8vo. Pp. vi + 320. *Price* 3*s.* 6*d.*

James Chalmers of New Guinea. By Cuthbert Lennox. London: Andrew Melrose, 1902. New Edition. Large Crown 8vo. Pp. xiv + 208. *Price* 2*s.* 6*d.*

Mediæval Rome 1073-1600. By W. Miller. "Story of the Nations." London: T. Fisher Unwin, 1901. Large Crown 8vo. Pp. xix + 373. *Price* 5*s.*

The Naturalist on the Thames. By C. J. Cornish. London: Seeley and Co., 1902. Royal 8vo. Pp. viii + 260. *Price* 7*s.* 6*d.*

Highways and Byways in Hertfordshire. By H. W. Tompkins. London: Macmillan and Co., 1902. Crown 8vo. Pp. xiv + 340. *Price* 6*s.*

The Norwegian North Polar Expedition in 1893-1896. Scientific Results. Edited by Fridtjof Nansen. Vol. iii. Sections ix. and x. Christiania: J. Dybwad. London, New York, Bombay: Longmans, Green and Co. Leipzig: F. A. Brockhaus, 1902. Demy 4to. *Price* 32*s.*

The Lake Counties. By W. G. Collingwood. "Dent's County Guides." London: J. M. Dent and Co. Fcap. 8vo. Pp. xii + 392. *Price* 4*s.* 6*d.*

The Nearer East. By D. G. Hogarth. "The Regions of the World" Series. London: William Heinemann, 1902. Large Crown 8vo. Pp. xv + 296. *Price* 7*s.* 6*d.*

Living London. Edited by George Sims. Vol. i. London, Paris, New York, and Melbourne: Cassell and Co., 1902. Pp. viii + 384. *Price* 9*s.*

The Story of Cairo. By Stanley Lane-Poole. London: J. M. Dent and Co., 1902. Pp. xx + 340. *Price* 4*s.* 6*d.*

The Real Siberia. By John Foster Fraser. London, Paris, New York, Melbourne: Cassell & Co., 1902. Crown 8vo. Pp. xvi + 279. *Price* 6*s.*

Ten Thousand Miles in Persia. By P. M. Sykes. London: Murray, 1902. Pp. xv + 481. Royal 8vo. *Price* 25*s.*

Spanish Life in Town and Country. By L. Higgin. London: George Newnes, 1902. Pp. 289. Crown 8vo. *Price* 3*s.* 6*d.*

Neue Skizzen von der Adria, von San Marco bis San Giusto. By Joseph Stradner. Graz: Leykam, 1902. Pp. 176.

The Gold Coast Guide. By Rev. J. B. Anaman. London: *Christian Herald* Office, 1902. Pp. ix + 175. Small 8vo. *Price* 5*s.*

The County Directory of Scotland, 1902. With Map. Edinburgh: Grant and Son. Price 15*s.*

Publishers forwarding books for review will greatly oblige by marking the price *in clear figures, especially in the case of foreign books.*

THE SCOTTISH

GEOGRAPHICAL

MAGAZINE.

THE KIRGHIZ.

By Professor Jules Brocherel.

(Translated from the French.)

(With Map.)

Under the name of *Kirghiz* is and has been usually included the whole of the hordes who people the vast extent of steppes and mountains bounded by the Irtish, the Ural Mountains, the Syr-Daria, and the chains of Thian Shan and Tabargatai. It is thus at least that travellers and *savants* have continued to name these wandering peoples. In the district itself, however, this name is only accepted by the inhabitants of the Celestial Mountains. The nomads of the plain do not in any way know themselves as Kirghiz—they call themselves Kazaks.

The first travellers who came into contact with these barbarians troubled themselves very little about gathering together under the same name all the individuals who, by costume and manners, seemed to them sprung from the same race. They divided them, however, into two great branches—Kirghiz-Kazaks and Kara-Kirghiz. Is it necessary to say that this classification does not rest on any scientific basis? It is picturesque, but not serious.

The Kirghiz have not yet been the object of any careful study. The *savants* who have observed them were for the most part merely passing through their country, and, further, only took for examination the types whom they met in the towns, and who had, through their town life, been able to modify the original characteristics of the race.

When one wishes to establish parallels between ethnographical subjects of different strata, it is of the first importance to go to the spot and

mingle with the tribes which have changed very little, if at all, their inherited characters.

It is to this superficiality of analysis that we owe the confusion of the Kirghiz with the Kazaks. People have confined themselves to bringing out the appearances of identity, without taking account of the contrasts which arise with them. These two peoples lead the same kind of life, dress in almost the same fashion, and have customs and traditions which vary very little from one to the other. But if we look at the question from the anthropological standpoint, we must admit that there are very pronounced dissimilarities between the two types. The structure of the body, the facial angle, the shape and dimensions of the skull, the exact shade of the complexion, the colour and density of the hair, are hardly at all analogous. It must also be noted that the Kazaks and the Kirghiz each speak a different language, that they mutually hate each other, and that they have never been able to endure being in close proximity.

Furthermore, they have a different point of origin. The Kazaks came from Asia Minor and joined in the migrations of the Nogai Tatars, with whom they have some very evident affinities. It is supposed that the name *Kazaks* comes to them from a tribe on the banks of the Volga, whose aptitude for horsemanship is said to have struck Alexander the Great, who from that time instituted regiments of cavalry. The name *Cossacks* is thought to have afterwards become generalised and to have been applied indiscriminately to all the nomads of the Steppes.

The Kirghiz, on the contrary, seem to have had as cradle the Altai Mountains, whence the Moguls are thought to have dislodged them, driving them upon the plateaus of Tabargatai. By the beginning of the eleventh century they had already made their home in the valleys of the Thian Shan, where they definitely remained.

The earliest mention of the Kirghiz is found in the Chinese annals of the period of the dynasty of Thang, which extends from the seventh to the tenth century of our era. As they are depicted by these writers of early times, the Kirghiz were a people with blond hair, black skin, and greenish eyes. Their country was covered with thick snow, and the rivers used to freeze down to half their depth. Their king bore the name of Atze, and dwelt in the Tzing-Chan Mountains. Judging from the examples that they supply, it appears that already at this time the Kirghiz used a dialect allied to the Turkish. Their reddish or blond hair has caused them to be placed, by certain authors, among the Aryan race. This is altogether erroneous, and is based upon an equivocal expression.

The Franciscan monk Giovanni del Pian Carpino (an Italian), and the Dutchman Rubruginus, who traversed Asia in the thirteenth century, recall that they saw, in the course of their journey, some savages flying into the precipices of the mountain. Some years later, Marco Polo, while crossing the Pamir, lodged in some Kirghiz tents. He cites them as very obliging people, by no means surly. About the same period, the Chinese missionary, Hionen-Tzang, passing through Zungaria, relates

that he met tribes of Kirghiz pasturing their herds of cattle and taming wild horses.

These witnesses, if they do not say much about the antecedents of the Kirghiz, at least affirm their presence, and agree in describing them in the same light. They themselves are convinced that the inhabitants of the mountain do not form the same people with those of the plain.

The etymology of the word *Kirghiz* is very difficult to establish. In the Turkish language it signifies *those who roam the fields*, while in the dialect of the nomads the word indicates *forty daughters—Kar-Kouz*. These are purely accidental synonyms which in no way clear up the true meaning of the word. Phonetically this word reveals mingled sounds of Chinese and Turkish, from which it might be inferred that it is a transfer into Turkish of a Chinese word. This hypothesis is the most probable one. The word is pronounced differently on the two slopes of the Celestial Mountains—on the north side the people say *Kourr-Kouz*, while towards Kachgaria they bring out the Chinese nasal, *Kir-ghiz*.

Further, by following the stages through which the name of this people has passed, we can find, connecting the two appellations, a very clear phonetic link, which strongly supports our supposition. It was the Chinese who first gave a name to the Kirghiz. In early times they were known by the name of *Kien-Kouen*, then by that of *Ha-Ka* and of *Ka-Kia-tzi*. When they had their abode on the Celestial Mountains they were called *Ki-zi-li-tze*, later, after an interval of some centuries, *Kir-Ki-tze*, and finally they received the name *Kirghiz*.

The Kirghiz have been classed among the representatives of the Turkish race, perhaps because of the religion which they affect to profess. Their physique is essentially of Mongolian origin.

The Kirghiz is generally well-built and of a strong constitution. He is slightly above the middle height, and his limbs are well proportioned. His forehead is low and projecting, his cheek-bones prominent, his chin pointed, his nose flat and squat at the base. His eyes are black and small, raised at the corners, and so recalling those of the Chinese. His neck is slender, the attachments of the muscles fine, and the feet and hands relatively small. The hair is almost always black and smooth. The beard and moustache are very scanty, and fall after the Mongolian fashion. Sometimes blond types are met with, having grey or blue eyes, but these are isolated cases.

It is rare to find among the Kirghiz individuals who are deformed or stunted. This natural selection and the robust constitution which they all possess, proceed from the fact that the rigorous climate and the brutal life that they lead, in the open air, on the mountains, strengthen them remarkably, at the same time eliminating sickly children in the cradle.

A physical peculiarity which is often verified among the Kirghiz, is to have the ears pressed down and the posterior part of the skull forming a flat surface. But these are purely accidental defects. The first is due to their head-dress, which, pressing down heavily upon the head, tends to thrust out the superior lobes of the acoustic organ. The flattened

form of the skull arises from the custom which the mothers have of swaddling their newly-born infants in stiff skins, which, not yielding to the weight of the head, squeeze it out of shape.

The men have generally a pleasing appearance. The women, on the contrary, are rather ugly than otherwise, and strongly betray characters of the Calmuck type. The nose is flatter, the eyes closer together, and the face more triangular than those of the men. As they do not veil themselves, and work constantly out of doors, their skin is as a result sunburnt and of a very disagreeable brick-red. While they are still

Fig. 1.—Young Kirghiz playing the flageolet.

young, and are left unemployed, they appear, if not prepossessing, at least capable of arousing sympathy.

Before she marries it is usual for the young girl to remain quiescent in the paternal *yurt* (tent) for a longer or shorter time, in order to fatten herself up ready for the day when she will belong to a man. The Kirghiz, like the Arab, only sees beauty in a woman if she is of rounded form and excessive stoutness. But after two or three years the muscles relax and the flesh sinks down, furrowing the body with a network of wrinkles, and giving the woman a hideous and repulsive appearance.

The Kirghiz are not exactly of excessive cleanliness, but neither can one fail to recognise in them a certain respect for their person. Although they live in constant promiscuity with their animals, and plunge about in the mire, they are often decently and becomingly dressed. They

always wash before and after a meal, and during hot weather they often bathe in the stream which traverses their village.

The costume of the Kirghiz is very elementary. Above a shirt of printed cotton, with sleeves disproportionately long, and wide trousers likewise of cloth, gathered in to the waist by a string, the Kirghiz, man or woman, puts on a sort of coat made of padded linen, which is fastened on the chest by buttons, or simply held together over the stomach by a scarf tied round the waist. The sleeves of the coat are very short, not even coming to the elbow, so that the shirt falls over the hand and has to be thrown back every moment by a quick movement of the wrist. The Kirghiz have performed this gesture for centuries.

Add to this a kind of boot coming to the knee, with a heel at least ten centimetres high, and a cap of leather or cloth hiding the baldness of the carefully shaven skull, and you have before you the whole equipment of a Kirghiz.

This rudimentary costume constitutes the indoor toilet, or, if you prefer, that which is generally worn in the *aul* (encampment) in summer. In cold weather and on journeys, however, the Kirghiz protects himself against the inclemency of the seasons by breeches of skin and an ample *chapan*, a sort of overcoat which covers his whole person. According to the temperature, he wears one, two, or even more, if necessary. He then covers his head with a round hat of white felt, of which the flaps, edged with a wide black plait, droop in front and are caught up at the back. This piece of headgear is a Chinese reminiscence, and, as it is not always easy to get it, it is replaced by a cap of coarse felt, lined with lamb's wool having the hairs inwards, the edge, folded outwards, forming a sort of cushion around the head. This head-dress is not at all ungraceful, and admirably completes the costume. It has especially this advantage, very valuable on the mountains, that it admits of being pulled down over the ears and of being worn with the hair outwards in case of rain.

The women dress exactly like the men, only the details varying. Thus the boots are more elegant, embroidered with silk, ornamented with crimped leather, brightly coloured, and with copper points on the sole and heel. The trousers are wider and longer, and the *chapan* is of a richer and more conspicuous stuff, sometimes of silk from Boukhara or Kachgar. When they work, they wear a heavy, padded apron, in order to protect their knees against the roughness of the soil.

What especially distinguishes the Kirghiz women is the white cap which covers their heads, giving them a monkish look. Imagine a cylinder, thirty centimetres high, made of a band of starched linen, rolled round the head and with the two ends floating down the back. The hair is carefully drawn up and imprisoned in this box, which serves besides as a pocket in which to place temporarily the trifling objects which a woman needs each moment. Thus, as you see, it is very useful. From the back hangs a chain, carrying attached to it, at its lower extremity, a bunch of keys and of copper plates, which falls to the heels in such a way that at the slightest movement you hear a clinking of iron like that which a convict makes when he walks.

On great occasions the Kirghiz women adorn themselves with silver jewellery, deck themselves with gewgaws and tinsel, and smear their skin with mutton fat.

The turban, the "eletchik," is the badge of married women. Young girls replace it by a cap of fox's fur, with a little plume of eagles' feathers in the form of an aigrette. They divide their hair into several plaits, some of which fall from each side of the temples, while others hang down the back, where they are held together by a square of coloured stuff, edged with hair and ornamented with glass beads and coral.

The young girl in quest of a husband is adorned with jewels and

FIG. 2.—Kirghiz women, with characteristic head-dress.

richly dressed. But for this coquetry she has to pay dear later on, when she becomes the slave of a man often brutal, always authoritative.

The Kirghiz *yurt* is composed of a framework of flexible wood, joined at the intersections by leathern thongs, the whole being fixed in the ground by means of pegs. This wooden structure rises to a height of between two and three metres, being the same in width. The roof is held up by wooden rods, which converge like rays to the middle of the dome, in which there is contrived a circular aperture, which serves at the same time as a chimney and as a window. Upon this slender framework are fitted large pieces of felt, kept attached to it by a system of cords. The whole can be set up or taken to pieces in a few minutes. The *tout ensemble* forms the load of two camels.

The interior is very simple. Piles of felt, serving as mattress and coverlet during the night, wooden chests, leather bottles, harness, and other articles of less importance, lie about to some extent everywhere, fastened to the walls or strewn on the ground. Sometimes a curtain drawn across one corner conceals the women's apartment. The entrance is closed by a blind made of felt, which is raised and lowered at will.

In the very middle of the *yurt*, placed on three vertical stones or on a sort of pedestal made of iron, is enthroned a large cast-iron pot—the *kazan*—in which the nomads do their primitive cooking.

The Kirghiz, being scarcely acquainted with matches, kindle their fire by rubbing on a stone. Each of them is furnished with a tinder-box, which never leaves him, any more than does a knife with fixed blade which serves the most diverse uses—for killing animals, shaving his own skull, cutting wood, etc.; it is, in a word, the sole cutting instrument which he possesses.

Well-to-do families have bowls made of earthenware or of wood that has come from Russia. These vessels are carefully wrapped up in rags and shut up in boxes kept for the purpose, which are only opened on great occasions.

The Kirghiz live almost exclusively on *koumiss*, a heady drink made of fermented mare's milk, which, drunk to a certain amount, produces giddiness and even intoxication. Gulping down this liquid requires a strong digestion, for it contains a quantity of dirt and gives off such a smell that the mere sight of it arouses nausea.

But the nomads are passionately fond of it, and in order to have some after a long abstinence are capable of committing acts of madness. The bottle of koumiss is at the disposal of passers-by, and is never refused to travellers. Also, when he sets out on a march the Kirghiz does not trouble to provision himself with enough for the journey. He always counts on the *auls* that lie scattered along the road.

Apart from the koumiss, his favourite drink, which he uses every moment, and without which he could scarcely live, the Kirghiz only takes one meal a day, and even that not every day. Assembled in the *yurt*, ten, fifteen, twenty persons crouch round the kazan, which is capable of holding an entire sheep. Each of them pulls out the dagger which hangs in a sheath at his girdle, lays hold of a bone, and gnaws it so long as any trace of nourishment remains on it. Afterwards every one takes in turn a draught of the broth until it is exhausted, washing down the whole with copious drinks of koumiss. After having fortified himself in this manner, the Kirghiz willingly lets himself fall into the state of somnolence inevitable to laborious digestion.

However, on gala occasions the ordinary fare of sheep, goat, or horseflesh is replaced by daintier and choicer dishes. The dish which is the most in honour and which Europeans can swallow without too great repugnance, is prepared by stringing on a stick alternate pieces of meat and balls of fat, and then cooking them slowly on hot ashes. This is what is called *Chizliks*. Another dish—the kainagam—is prepared by grating and then kneading together in broth flavoured with aromatic herbs, pieces of cooked meat. The whole then forms a blackish and

very thick paste, which is swallowed I do not quite know how. Merely to see it manipulated is enough to take away one's appetite.

Some Kirghiz also use tea and bread. However, the latter is made on the spot and of barley meal, rolled into balls and roasted with mutton fat.

The Kirghiz people roam over a district exclusively mountainous, the area of which may be estimated at about 4500 square kilometres. The extent of their domain is comprised within 74° and 81° East Longitude, and 40° and 43° North Latitude. The Kirghiz are penned up in the high valleys of the Central Thian Shan, almost all on Russian territory, and they are under the jurisdiction of the governor of Pijevalsk, a district of the Province of Semiretchensk.

On the north they have as boundaries the Alexander and Ala-taon-Translian Mountains; on the east they hardly go beyond the chain of the Khan-Tengri; on the south the valley of the Kok-chaal-Darya; and on the west the Ferghana. They are enclosed by four distinct races—the Kazaks, the Kalmucks, the Kachgarians, and the Tadjiks.

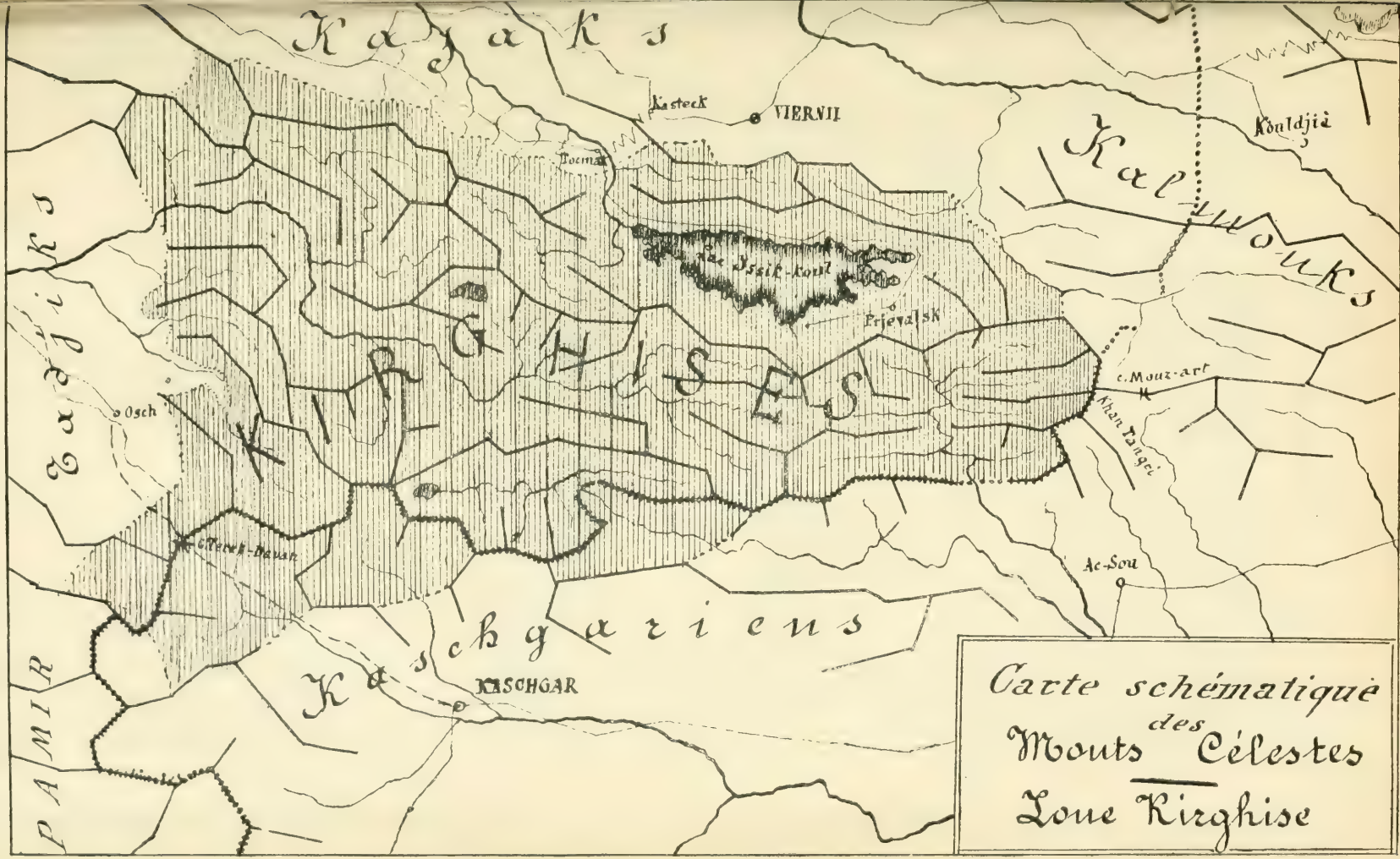
They are divided into two great sections, that of the *left* and that of the *right*. The first, called the *Sol*, comprises the upper basins of the Narin, the Syr, the Oxus, and the Kok-chaal-Darya. It numbers four tribes—Koutchi, Saron, Mendouz, and Kitais. Under this last name are designated the inhabitants of Chinese territory. The second branch, called the *On*, resides in the basin of the lake Sassik-Koul and in the valleys adjoining the group of the Khan Tengri. It numbers seven tribes—*Bougou*, *Sary-Baghichtek*, *Sou-Baghichtek*, *Soulton*, *Zchierik*, *Sagass*, and *Bassiutz*.

The Russian Government has classified them differently, calling them by the name of the valley in which they habitually encamp. Thus *Tounghensky* designates the individuals who frequent the valley of Tounghent-ak-son, and so on with the rest.

It goes without saying that the Russians do not know the exact number of their Kirghiz subjects. Most of them at present still avoid payment of the tax, although so moderate, of a rouble and a half per *yurt*. The Kirghiz are only nominally under the rule of the Czar; as far as tribute goes, they have remained as they were before the occupation of Turkestan. Their mountainous and often inaccessible country lends itself admirably to keeping away all desire after official control.

It is impossible to make even an approximate estimate of the number of individuals included in the Kirghiz people. Some speak of 300,000 or 400,000, but they are certainly more numerous than that. However, even the chiefs of a village do not know exactly the number of the members of the *aul*, though they know that of their herds of cattle.

The Kirghiz have no very definite ranks of society. They owe obedience to no one, save of course to the Russian Government. However, the latter has nominated responsible chiefs in each tribe, or rather it recognises the authority of the persons whom the *auls* elect as civil and judicial representatives of Russia. According to the importance of the tribe these are called *Kallehi*, *Chirtai*, or *Baloch*. These chiefs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Prjevalsk
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Khan Tangri
Osch
Kaschgariens
KASCHGAR
Ac-Sou
PAMIR
Carte schématique des Monts Célestes
Zone Kirghise

only enjoy prestige if they are rich. It is they who decide the differences which arise between tribes and individuals, and who punish those guilty of a crime or misdemeanour. But it must be confessed that they hardly ever make use of this prerogative ; rather than incur unpopularity with their subjects, they prefer to leave matters to arrange themselves.

The Kirghiz have always been, and will be for a long time to come, a pastoral people. Some have wished to accustom them to agriculture, and an attempt in this direction has been made near Pijivalsk. But they scarcely felt any vocation for it, and the fields of oats were quickly deserted for the lofty solitudes of the Thian Shan. Nevertheless, agriculture might be made to succeed wonderfully in these regions, for the soil is fertile and there is never any lack of water. It would bring wealth to the country and easy circumstances to the inhabitants.

For the Kirghiz, a simple people, devoid of all ambition, happiness consists solely in eating a great deal, in sleeping still more, and in disposing of a perpetual *far niente*. Men, women, and horses, it is all that they ask for. Their lives flow on peacefully between their families and their flocks. They avoid all that might disturb their tranquillity.

They shun a sedentary life, and could not shelter under any other roof than the dome of a *yurt*. When a Kirghiz has to go to a town to conclude a bargain or make a purchase, he never passes the night there. He hastens to rejoin the first encampment of nomads, where he anticipates hospitality.

If the ancient world placed the Tartar in these mysterious regions, and thought it recognised in these savages the figure of a Centaur, half man and half horse, it must be agreed that the Kirghiz still corresponds to-day to the idea of the Centaur. He must be seen on horseback, agile and erect. He and his horse seem to form only one creature, and he accomplishes thus, without the slightest fatigue, the longest journeys.

The Kirghiz feels in his element only when he is on horseback. His language, not well developed in general, abounds in expressions relating to horses, and he has a particular name for them for each year of their life. He has not, like the Arab, made a *cult* of his horse—he has not known how to raise and ennoble its nature, but he uses it, and could scarcely live without his steed, who fills a part of his existence.

The Kirghiz horses are far from having the elegance and suppleness of the Kurdish or Persian horses. They are small and thick-set, with enormous belly and shaggy hair, which assumes all sorts of shades. But they are very strong, and can bear the greatest fatigue. Above all, they show exceptional aptitude for travelling in high mountains ; they are Alpine climbers beyond compare. They go along precipices, traverse rivers, scale rocks, and cross glaciers with a sureness and ease which cannot but surprise one. They *feel* the crevasses concealed under the snow, and leap them at a bound ; on uncovered ice they pick out the rough places, spreading out their feet so as to have more hold, and they put only the tips of their hoofs in the interstices of the ice, in order the better to hold themselves back.

The Kirghiz breed a large number of horses—or rather, let them

breed themselves—in order to have a great deal of koumiss. Every season they make a selection of them and go to offer them at the fairs of Kouldja or Kashgar, where they are sold at from 30 to 50 francs each.

To mount them the Kirghiz summarily harnesses them with ropes or leather thongs, and saddles them with a sort of wooden pack-saddle, on which he throws the extra chapan. The Kirghiz horses, although living in the wild state, are very docile, and there is no need to beat them to make them go. They are simply encouraged with the voice.

The Kirghiz, perched on his steed, is very daring, and master of his movements; on the ground, on the contrary, he becomes as heavy as

FIG. 3.—Kirghiz horse climbing an ice-slope (Thian Shan).

lead. He detests walking, and, when he can, even avoids going a hundred paces. To get from one *yurt* to another he keeps a mount permanently in front of his tent. His gait resembles a little the swaying movements of a bear when walking. He cannot stand for more than a few minutes at a time, and one cannot imagine Kirghiz talking in the vertical position. If they have anything to say to each other, they immediately squat down on their heels, one opposite the other, and in this uncomfortable position they are capable of remaining for hours at a stretch.

The horses are only very rarely employed as beasts of burden. For transporting baggage from one tent to another the Kirghiz use camels and oxen. The women ride astride like the men, and the children are already horsemen at the age of six.

Some travellers have thought the Kirghiz fierce and unmanageable, but they are on the contrary very good-natured. They have not the warlike spirit of their neighbours of the Steppes, who are thievish and indolent. They are above all and before all cowards. They never cherish rancour; after settling a quarrel they become good friends again as before. They are not acquainted with the *vendetta*, that prompt method of justice which is practised in almost all non-civilised societies.

Side by side with a lively intelligence and a very subtle and ingenious mind, the Kirghiz has a good nature and a *naïveté* which are truly phenomenal. This simplicity of character perhaps proceeds from the kind of life which he leads and from the isolation which he imposes upon himself. He is a fatalist in the highest degree. Everything is for him a good or evil omen; the fall of a filament on a white stone, the red or yellow light of the flame, the colour or form of a cloud, the meeting with such-and-such an animal or the sight of such-and-such a flower—all that has a meaning for him, and on these mere nothings he often bases the acts of his life.

For exorcising evil spirits he has recourse to all sorts of expedients, and his childishness is without limits. Thus a stone that is slightly strange, the presence of a bush in the crack of a rock, the phosphorescence of an animal, or the unusual warmth of a hot spring, assume for him the proportions of a miracle, and he only approaches these objects after waving his arms and making repeated genuflexions.

The Kirghiz call themselves Sunmite Mohammedans, but are not really so. They perform neither the ablutions nor the prayers prescribed by the Koran: they have neither mosques nor mullahs, and have no acquaintance with pilgrimages to the tomb of the prophet. In fact, they do not profess any very distinct belief: they rather imitate a little all the Shamanist sects which formerly flourished in North Asia.

But there is one precept of the Koran which the Kirghiz follow to the letter, namely that which counsels plurality of wives. As far as the number of his herds renders it possible, the Kirghiz will marry one, two, or three wives, and even more if he can.

The number of his wives is in proportion to the quantity of cattle that he possesses, for the Kirghiz buys the former at this marketable value. Sometimes the price is even raised, if it is the young daughter of a chief or of an important personage. She is then worth as much as twenty or thirty thousand francs.

The men marry very late, for the sons have to wait till their father has ceased to form new marriages, so that they may dispose of the herds.

The women, marriageable from the age of ten, marry early, but after two or three years of marriage they are old and worn out. They have few children.

The education of the children is quite Pantagruelian. They prowl about naked like animals, crying hunger on all occasions. Gorged on a milk-diet, they become as dumpy as little barrels. No one looks after them; they grow like the animals, getting thin in winter and fat in summer, just like the mares, and, like the latter, delighting in the high pastures of the mountain.

The Kirghiz live in, and lead their flocks into, definite places. Each tribe and each *aul* encamps always in the same valleys and on the same spots. On the approach of cold weather they join their winter camp, and on the return of hot weather they reoccupy their summer encampments. They set up their *yurt* on the same spot, and they place their *kazan* on the same stones, which they easily recognise, the flame having calcined them.

The children succeed their parents, who have bequeathed to them rights over the pastures, aptitudes for eating a great deal and sleeping still more, and, with that, very fixed customs, which bring it about that their actions, whether it is a question of the construction of a tent or of the care to be given to the cattle, are often determined by superstitions having the force of law, because they have been consecrated by the ages and handed down through a long succession of ancestors.

The Kirghiz do not feel any very strong affections. They are not capable of a deep emotion; everything is indifferent to them, as well the most immediate danger as the happiest event. They never boast, and in presence of danger they do not lose courage.

Their brain, from not being able to manifest and reflect itself, becomes atrophied in a perpetual inaction. Being acquainted with nothing beyond his family, his *yurt*, and his cattle, the Kirghiz willingly ascribes an improbable meaning to all that goes beyond the restricted framework of his comprehension.

Having no immediate contact with civilised peoples, they hardly see the utility of knowing how to scribble on or decipher a piece of paper. They are all illiterate.

The Kirghiz language is very composite, but also very poor and rudimentary. Of Turkish origin, it has borrowed a little from all the mediums through which the people have passed.

The word *sou* serves to designate water in general, springs and rivers; *mouz*, ice and snow; *tchion*, all that is large in volume and quantity; *Darë* generalises and includes all the therapeutics of the nomads. The meaning of a word is modified by laying more or less stress on the vowels; thus *taou*, height, becomes *tâaou* for a great mountain, and so on.

The Kirghiz have never had any literature. The stories that they tell each other on the long winter evenings, and the laments which they pour forth in moments of recreation, have been passed on from generation to generation and from one to another. Sometimes they accompany their songs with a lute, or else they play a flageolet, made from the branch of a tree.

Since they are devoid of artistic sense, the objects which surround them are very rustic, and hardly ever embellished with those naive ornamentations with which childish peoples delight in adorning their instruments and their habitations.

The Kirghiz tombs certainly sometimes betray an original and personal style. They are composed, according to the importance of the deceased, of piles of stones heaped up in pyramids, of trunks of trees laid across each other, of cones of potter's earth arranged in steps, or of high

walls pierced with holes so as to form designs, or of canopies supporting a pole, on the edge of which are placed different emblems, as horses' tails, animals' skulls, and glass beads.

The Kirghiz are made up of antithesis and enigmas. Side by side with ancestral defects peculiar to the race, they display dispositions which only require to be cultivated and developed. As long as their mountains remain uncultivated and ramparts of granite separate them from the rest of the world, these nomads will remain as they are. For them to walk in the way of progress and to accept another life, another race more powerful than their own must draw them into it.

That will not happen very soon—Central Asia is too vast and too scantily peopled. Russia, which owns it, has not sufficient hands to cultivate it. The former fertility of this peculiarly favoured region, which has however been laid waste by wars, can only return with an influx of new vigour.

Perhaps the construction of a Central Asiatic railway uniting the Trans-Caspian with the Trans-Siberian, and the carrying into effect of the grandiose project of Richthofen, passing through Zungaria and the plains of Hoang-Ho as far as to Chang-Hai—perhaps, I say, two works like these will one day put an end to the decrepitude of this land, and rejuvenate these peoples.

A NOTE UPON THE METHODS OF BOTANICAL GEOGRAPHY.

By Marcel Hardy, Botanical Institute, Montpellier.

When we seek to put in relief, with the aid of graphics, the ecological conditions of vegetation, we have to choose between two methods, very different yet with numerous points of contact between them, which may give in certain cases identical results. The floristic method, adopted by H. C. Watson in England, and followed, after him, by the majority of English botanists, has been brilliantly expounded and discussed in France by Alphonse de Candolle. The geographic or ecological method has been defined by Warming, and put in practice by some botanists, among whom we shall cite only M. Flahault in France and Robert Smith in Scotland.

Though these two methods of considering vegetation have been frequently discussed, it may not be useless to consider them once more in order to show their close relationship and to arrive at a definitive choice in view of the work which has still to be undertaken.

Watson thus defined his method (8)[1]: "To group methodically all the facts which show the general distribution and the particular habitats of plants distinctly indigenous or fully naturalised; then to determine the physical causes which influence their actual distribution." In applying

[1] Figures refer to bibliography at end of article.

his method, he observed each species, tracing its area of extension, as well as its distribution in that area; and by examination of the habitats he was able to define precisely the ecological station of the species. The same process applied to the genera with the species as units, and to the families with the genera or species as units, gives some positive information upon the origin, the migrations, and the vicissitudes of these genera and families.

The graphic expression of these studies consists of a series of partial maps of the distribution of the vegetable species, genera, and families. It is obvious that in their application to genera, tribes, and families these studies and their graphic representation can have only a very small ecological value. Their interest is mainly floristic. If, however, we consider only the maps of the distribution of the species, we have to take account of two factors of equal importance, the ecological factor and the historic factor. But it is very difficult and inconvenient to eliminate this last element. Moreover, we can at best make only partial maps, of which the most general are those of the distribution of families. These processes are thus incapable of furnishing a complete account of all the vegetation of a country.

When the question was of a complex vegetation and of the division in natural limits, the problem was insoluble. Since the beginning of the nineteenth century several attempts have been made to solve it. The vegetable carpet has been seen to change from one region to another, yet none could explain what Alexandre de Humboldt had perceived. Some botanists, as Willdenow (6) took as a basis of division the hypothetic origin of the vegetable inhabitants of different countries. Others, as Schouw (6) claimed to divide the natural countries by the proportion of the species which are indigenous to them. Grisebach, attempting to give form to the admirable intuitions of Humboldt, endeavoured to establish the idea of the grouping of plants possessing a common physiognomy, but was unable to define his thought, and, consequently, to trace it back to its origin.

Alphonse de Candolle (2) favoured the system of Schouw, but with a prudent reserve. His indecision, in this respect, clearly explains his assertion that he drew more profit from floristic studies than from the studies, still so vague, of botanical geography. After Darwin, however, and with Grisebach, Drude, Warming, the notion of vegetable association was made clearer. Finally, Warming (7) in 1896 succeeded in defining the notion of biological form and the correlative notions of ecological relation and of association—bases of new methods of investigation.

The consideration of ensembles has one prime advantage: it eliminates the palæontological element, which is mainly individual. It is, besides, the only method which leads to the synthetic representation of vegetation, and to its division into natural categories.

But the floristic method, far from losing its value, has acquired a new importance as an indispensable basis of botanical geography. It is, in fact, of the greatest necessity to know first of all the mode of life, the conditions of existence, and, if possible, the origin and the age of each species, and its place among the actual vegetations.

The new methods have been sufficiently defined already, so that we need not return to them now. But it is necessary to draw attention to some special points to which the daily progress of botanical geography gives great importance.

Countries of ancient civilisation, in particular Western Europe, have been so thoroughly modified by man that the spontaneous relations of the ensemble of the district with the vegetation no longer appear so clearly. Deforestation, drainage, the damming back of streams, cultivation, etc., have altered in a remarkable way the primitive aspect of our countries. Sometimes these changes owe their persistence entirely to the incessant care of man. Sometimes also the alteration of physical conditions has become permanent, and has produced the establishment of a new equilibrium between the vegetation and the environment, so that a purely statistical account of the actual vegetation rests upon heterogeneous elements and may give false impressions.

Take an example which may be applied to Scotland. At the present moment we can see in Germany, as in Scandinavia, great tracts of heath of which the origin and the destination are different. Some of these represent a spontaneous phase in the history of the vegetable carpet; heath plants have, for example, taken possession of the sand of the dunes, under certain conditions of climate, in such a way as to perfectly represent the resultant of the physical agencies. Others, on the contrary, are the result of deforestation; and among these we find some which persist only because man utilises his lands badly or leaves them to the teeth of his flocks. When the action of man ceases to make itself felt, the forest gains foothold by degrees. On the other hand, we see that the efforts of foresters are ineffectual in many places which we know by reliable documents bore prosperous forests in the middle ages. This is due to a change in the substratum, brought about without the intervention of man, and which forms a powerful obstacle to the prosperity of the forests (4).

In other places the destruction of forests has caused the formation of marshes and peat-bogs. Left to themselves these peat-bogs may transform themselves into dry heaths, or into forests again, or may persist indefinitely. Elsewhere, again, marshy prairies extending by the side of rivers have been drained and made fit for cultivation. Some of these return spontaneously to their former condition; while in others, draining, the damming of streams, the deepening of the beds of the rivers, have produced lasting effects.

Now, can a purely statistical account of these results claim to be a coherent and methodical contribution to phytogeography? Can a map which notes such heterogeneous elements from the ecological point of view claim any real scientific value? We do not think so. Such a method must involve too many errors to permit of any synthesis, however insufficient. It must certainly fail, in the end, to accomplish what has been attempted, namely, to represent the vegetable carpet in relation to the ensemble of the natural environment. Moreover, it is a fundamental necessity in cartography to register homogeneous elements only. Now, when we cease to consider the different aspects of the vegetable cover as

simple statistical units, when we regard them as the expression of a relation which all studies of nature prove to be general and necessary, we cannot, without risk of incoherence from the philosophic point of view, introduce the effects of causes which cannot be included in those which we agree to regard as natural. In this respect, then, we ought to take for a basis what we may call the *vegetation of equilibrium*. For a given place and for a given ensemble of natural conditions, whether physical or biological, there is a spontaneous vegetation which presents the most complete adaptation to environment, which constitutes the most perfect expression of the ensemble of the natural conditions. This vegetation resumes its rights when, after having modified it, man ceases to intervene. It is this that we must endeavour to restore, in the archæological sense of the word, because it alone gives exactly the nature and the value of the ecological relations for the country considered.

If, however, we would desire to pass beyond this, and represent in a purely statistical manner the actual elements of the vegetable carpet, what would such an account represent? We would find ourselves at first in face of cultivated fields. If we confine ourselves to the noting of these under the general rubric, "cultivated fields," we leave important gaps and deprive the reader of valuable information. On the other hand, to note the kind of culture is not only to introduce a new complication resulting from very arbitrary variations of cultivation and from the demands of the market, but also to register the failings and the gropings of agricultural processes in which, it must be remembered, empiricism and tradition still play the greatest part.

Beside these fields actually under cultivation, uncultivated ground extends everywhere, land in all the stages of its evolution. Shall we try to register this infinity of aspects? Certainly, it is not without interest to the botanist to note thus all the phases of "repeopling," for we should derive much valuable information from it. But we should then no longer represent associations answering the idea which has served as the basis of our work. The notion of vegetable association carries with it, indeed, as its fundamental element, *a certain persistence* in the forms which compose the association, and which ought to be found again in their mutual relations when the conditions of the environment are reproduced. It concerns itself not with a purely temporary and casual grouping of plants, whatever may be their relations. What constitutes the physiognomical type or the adaptation of the organised and autonomous vegetable ensemble which we call *association*, is the necessary presence of certain forms in certain proportions and presenting among themselves certain biological relations.

Let us now examine the conditions which these waste lands, moors, heaths, etc., present as the result of the action of man. What essentially characterises them is the extreme variation, even from one year to another, the complete absence of proportion and of stable equilibrium in the elements, the want of adaptation, of organisation, of autonomy, of individual and constant character. According to the date of the cultivation or of the abandonment of it, according to the proximity of this or that form of cultivation, the use which the proprietor makes of his land,

the works which he has carried out, the cattle which he has put upon it, his way of exploiting the land, to cite only some ordinary circumstances, the moor or the heath will completely change its aspect, and will present to the eyes of the botanist a picture of the confusion of the struggle of plants against man and of plants among themselves. There are here no associations answering the description so well given by Kerner (5), so clearly defined by Warming. Every cartographical basis thus fails. We are obliged to come back to the reconstitution of spontaneous nature.

The application, it must be confessed, presents serious difficulties, especially in particular cases such as those which we have pointed out for the heaths of North Germany. The reconstitution is deduced from an ensemble of comparative and critical observations, floristic, climatic, agricultural, biological, and historical, to the making and the synthetising of which some experience is necessary. Robert Smith threw some light upon this a few years ago in an interesting work. As to the application and the result, an example may be found in the map of the region of Perpignan published by M. Flahault in 1896 (3).

As Dr. William Smith said, only a few months ago, the maps published by Robert Smith ought to be considered only as attempts towards a more scientific representation of the vegetation of Scotland. They can and ought to serve as basis for attempts towards the reconstitution of spontaneous nature. If, moreover, we trace, upon such a map of reconstitution, the areas of the different actual cultivations, we can show clearly some relations from which agriculture and forestry may derive some valuable help.

On account of the small number and the isolated character of ecological studies, the importance and the mode of action of the different natural influences upon vegetation have been the subject of very different interpretations and estimates. Until quite recently it was an axiom among agriculturists that the nature of the soil is the principal factor in the modification of the vegetable carpet. The corollary of this system was that the best agricultural map was the geological map detailed and slightly modified for the requirements of practice.

Thurmann saw in the physical constitution of the soil the cause of the differences observed in the natural landscapes. Others, before and after him, claim to explain all by the chemical nature of the substratum.

Another system of phytogeographical division is based in the first place upon the richness of the substratum in nutritive substances, and in the second place upon the degree of moisture of the soil (4).

Some recent works insist above all upon climatic influences, thermal means and extremes, winds, light exposure, etc. (1).

All these interpretations, depending generally upon the field of observation taken by their authors and their protagonists, show the multiplicity of the natural factors of which we have to take account.

Now, the subordination of the climatic, edaphic, and biological influences can result only from the classification of the phytogeographical units. This classification itself requires a rational and homogeneous nomenclature applicable to different countries. M. Flahault has endeavoured for some years past to demonstrate this, submitting at the

same time an attempt towards such a nomenclature which, without doubt, will soon take definitive form.

Whatever may be the conclusions adopted, it is important that each country should contribute to the solution of the problem in establishing upon bases as rational as possible the classification of the biological forms found there, and of their associations in natural landscapes. Here it is necessary to distinguish two elements: on one hand the physiognomical type, the biological forms and their associations; on the other, the territorial limits in which definite ensembles of these associations are found.

We possess, upon the subject of these physiognomical types of associations, a certain number of plans, notably those of Kerner (5) and of Engler and Drude's monographs (9). But these are too general to serve for a detailed description of our countries, and their interest is mainly of a speculative order. We ought then to endeavour to draw up a particular plan for each natural region. Robert Smith has bequeathed to us one which serves for Scotland; and it remains now to complete it, so that it may be applied to all the associations of each country. But beyond this and above all, it is necessary to systematise it, to adapt it to nature, by causing it to correspond with the conditions of the environment. To indicate clearly the physical and biological environment of each type of association, to show the mutual adaptation and to group naturally these associations in more general units, such is the task which has to be accomplished from the ecological point of view.

As to the division of a country into natural areas bearing definite ensembles of these associations, several projects have been proposed of which the most recent is that of M. Flahault. It is to be hoped that the question will soon make rapid progress, aided by the activities of botanist-geographers.

To complete this work it remains to define and to name a whole series of inferior units, mainly dominated by local conditions of soil, exposure, or other biological circumstances. In this task the particular studies made in different countries will doubtless contribute. The problem exists in its entirety for Scotland.

We owe to Robert Smith a representation of the zones of vegetation from the sea-level up to the mountain summits. But to rest satisfied with this division would result in an incomplete idea of the distribution of plants in Scotland. We have in this country two great regions quite distinct by their climatic conditions, and which correspond in their general lines to the two sides of the Atlantic and the North Sea.

The western or Atlantic section is distinguished from the eastern section by a greater rainfall, distributed over a greater number of days; by sensibly smaller annual and diurnal ranges of temperatures; finally by conditions of cloudiness, of prevalence of winds, etc. We shall have to make out and to define all these points by means of the vegetation.

In the western section itself we can distinguish the littoral zones exposed to the winds and to the Atlantic spray; the interior part of the sea-lochs, which is both calmer and richer. Still further inland, the zones which, by their altitude, receive the maximum of rain, and com-

pletely escape the action, direct or indirect, of sea-salt. The drier eastern part, where the wind is weaker, rarer, and colder, where the normal change of temperature is more considerable, includes, in the same way, other climatic subdivisions.

In the frame of these limits there are other subdivisions of less importance controlled by topographical conditions, by numerous varieties of rocks, and of superficial deposits. These important distinctions claim, from the practical as from the scientific point of view, careful classification.

We thus see, in a striking way, the place which the analysis of the conditions of the environment holds in the study of botanical geography. It is clear that an analytical description of the vegetable carpet of a country can be understood only if we give to that analysis the proportions which it claims. This necessity for a geographical commentary is felt very strongly after the reading of the literature bearing upon the question, in particular the works of M. Flahault, and those published by Engler and Drude in *Die Vegetation der Erde*. We cannot insist too much upon this point so important for the establishment of general ecological laws.

Since we are speaking of methods, we may mention in conclusion the necessity of employing in cartography and descriptions the system of decimal numeration. Alph. de Candolle lamented in 1855 that the majority of scientific works in the English language were only with difficulty intelligible by reason of the inexplicable survival in them of a complexity of numerations now disused elsewhere. To-day, it is true, North America has entered resolutely in a more rational way; but as this evil still exists in England and her colonies, humanity is deprived of a large number of valuable communications.

Conclusions:—

I. It is necessary to re-establish and to map *spontaneous* vegetation.

II. It is important to classify the geographical and the biological units.

III. It is advisable to give a considerable place to the analysis and to the description of the physical environment.

IV. We should employ the decimal numeration.

It is in this spirit that we should continue the work undertaken by Robert Smith, that it may be put upon a level with new phytogeographical methods.

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THE SURVEY OF BRITISH LAKES.

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As indicated in a previous number of the *Scottish Geographical Magazine*, the systematic work of the Lake Survey was started early in April last, and has since been carried on uninterruptedly under the personal superintendence of Sir John Murray, K.C.B. From Rannoch Lodge, where Sir John Murray and his family took up their residence towards the end of March, excursions were made to the lakes in the neighbourhood, and we are enabled to report that most satisfactory progress has been made. At the time of writing twenty-two lakes had been completely surveyed, viz., Lochs Earn, Tay, Tummel, Rannoch, Lochan Sròn Smeur, Eigheach, Laidon, Bà, Lochan na h-Achlaise, Lochan na Stainge, Buidhe, Lyon, Iubhair, and Dochart, in the basin of the Tay; Lochs Laggan, Lochan na h-Earba, Treig, Ossian, and Ghuilbinn, in the basin of the Spean; Loch Tulla flowing into Loch Awe, Loch Arkaig flowing into Loch Lochy, and Loch Crunachan flowing into the Spey. Lochs Morar, Shiel, and Eilt have since been surveyed, and the staff are now engaged on the surveys of Loch Maree and neighbouring lochs.

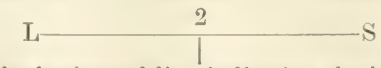
In carrying out this work Sir John Murray has had the continuous assistance of Mr. T. N. Johnston, M.B., C.M., and Mr. James Parsons, B.Sc., and for several weeks he was assisted by Mr. R. M. Clark, B.Sc. In the surveys of Lochs Ossian and Ghuilbinn he had also the assistance of Dr. J. Sutherland Black, M.A.; in the survey of Loch Laggan he was assisted by Sir John Jackson, and in the surveys of Lochs Tulla and Tummel he was assisted by Mr. D. C. M'Intosh, M.A. Mr. James Murray joined the survey in the end of April, and Mr. J. Hewitt and Mr. T. R. H. Garrett, of Jesus College, Cambridge, in the middle of June, while Mr. D. J. Scourfield has been studying the Entomostraca of the lakes during the past few weeks. In order to facilitate the progress of the survey in every way, Sir John Murray has added to his resources a motor car, specially built for him by the Albion Motor Car Co., Glasgow, and an experienced driver, Mr. Thomas Hardie, was engaged some weeks ago; the surveying staff will thus be enabled to proceed from one lake to another with the least possible delay.

The circumstances which led up to the present work of the Lake Survey are well known to the readers of the *Scottish Geographical Magazine*. A few years ago Sir John Murray and the late Mr. Fred. P. Pullar

undertook jointly to carry out a systematic bathymetrical and physical survey of the fresh-water lochs of Scotland, and they commenced with those lying in the basin of the Forth. The first part of their report, dealing with Lochs Katrine, Arklet, Achray, Vennacher, Drunkie, Lubnaig, Voil, and Doine, was published in vol. xvi. p. 193; the second part, dealing with Lochs Chon, Ard, Menteith, and Leven, in vol. xvii. p. 113; and the third part, dealing with Lochs Ericht and Garry in the basin of the Tay, in vol. xvii. p. 169. Just after this third part had been prepared for publication the work was unfortunately brought to a standstill by the accidental death of the late Mr. F. P. Pullar, who sacrificed his life in a gallant attempt to save others (see obituary notice, vol. xvii. p. 148). As a memorial to this talented young author, his father, Mr. Laurence Pullar, and his collaborator, Sir John Murray, decided that the work in which he took such interest should be completed at their joint expense.

Only four of the lakes recently surveyed by the Lake Survey had, as far as we are aware, been previously systematically sounded, viz., Lochs Tay, Earn, Rannoch, and Tummel, which were surveyed by Mr. Grant Wilson of the Geological Survey of Scotland, in 1888 (see vol. iv. p. 251); Loch Earn was again sounded by Sir John Murray and the late Mr. Pullar in 1900, though the results were not published. Mr. Wilson's soundings agree, on the whole, with those of the Lake Survey, the differences observed being probably due to a difference in the level of the surface waters at the time the surveys were made. For instance, the maximum depth observed by the Lake Survey in Loch Tay was 508 feet, whereas Mr. Wilson records a depth of 85 fathoms, or 510 feet; in Loch Earn the maximum depth observed by the Lake Survey was 287 feet, while Mr. Wilson records 48 fathoms, or 288 feet; in Loch Tummel the maximum depth observed by the Lake Survey was 128 feet, while Mr. Wilson records $20\frac{2}{3}$ fathoms, or 124 feet.

The methods and apparatus employed by the Lake Survey are the same as those used by Sir John Murray and the late Mr. F. P. Pullar, which were fully described in the first part of their report, and need not be repeated here, but special attention is now paid to the determination of the level of the surface of each lake above the level of the sea at the time the survey is being carried out, so that the true relation between the contour-lines above and below the water-level may be accurately known. Before sounding out a lake a horizontal line is painted, if possible on some convenient rock-surface, one, two, or three feet above the surface of the water, thus:



the figure above the horizontal line indicating the height in feet of that line above the level of the water. The height above sea-level is then carefully determined by levelling with a dumpy level to the nearest Ordnance Survey bench-mark. Each day the level of the water is compared with the Lake Survey level-mark, and any change noted, for sometimes the water of the lake may rise or fall while the survey is in progress. In Loch Treig, for instance, the water rose to the extent of a foot during

the time devoted to the survey, and the earlier soundings had to be corrected accordingly.

An interesting point in connection with the work of the Lake Survey is the record, probably for the first time in Scotland, of "seiches" in some of the larger lakes. A short note on one of these examples of rhythmic pulsation in the waters of a lake has been contributed by Mr. Parsons in a recent issue of *Nature* (see *Nature*, No. 1702, June 12, 1902, p. 162). Professor Forel believes that these pulsations are due to variations in barometric pressure, while they have been attributed by others to wind-velocity or to earth-movements. No continuous observations on this novel phenomenon have yet been made by the Lake Survey, but in the course of a few weeks a "limnograph," which has been constructed in Geneva under the supervision of Dr. Ed. Sarasin, will be set up on the margin of one of the lakes, for the purpose of giving a continuous record of the variations in the level of the surface waters of the lake.

The thanks of the staff of the Lake Survey are due to Sir Robert Menzies, Sir John Stirling Maxwell, Lochiel of Achnacarry Castle, Sir John Ramsden, and other Highland proprietors, for valuable assistance rendered during the recent surveys.

Some of the maps of the lakes recently surveyed are now sufficiently far advanced to enable us to offer a few preliminary remarks regarding their depth and conformation, which may be interesting to readers of the *Scottish Geographical Magazine*. The large figures giving the cubic mass of water in each lake are difficult to grasp, and, with the view of rendering them more intelligible, we have in each case indicated the dimensions of an imaginary cubical reservoir, into which the waters from each loch may be supposed to be run off.

Loch Tay.

Loch Tay may fairly claim to be the largest lake in the basin of the Tay, though Loch Ericht is quite comparable as regards length, maximum breadth, and maximum depth, but the average breadth of Loch Tay is greater than that of Loch Ericht. Its superficial area is therefore larger, its mean depth is greater, and it holds a larger cubic mass of water. Loch Tay is over fourteen and a half miles in length, over one mile in maximum width, the mean breadth being nearly three-quarters of a mile, and its waters cover an area of over ten square miles; it drains an area of 187½ square miles. Its maximum depth is 508 feet, its mean depth is 199 feet, and the bulk of water contained in the lake is estimated at about 56,550,000,000 cubic feet. That is to say, if the water in the lake could be placed in a cubical receptacle, it would require to be 1279 yards (or nearly three-quarters of a mile) in length, breadth, and height. Loch Tay forms a simple basin, the deepest portion (over 500 feet in depth) occupying a central position, about nine miles from the south-west end and five and a half miles from the north-east end, lying in the centre of the depression with depths exceeding 400 feet, which is over three and a half miles in length. About three miles from the south-western end there is a small depression, over half a mile in length, with depths exceeding 300 feet, separated by an interval of about one mile from the main 300-feet depression, which is seven and a half

miles in length. The 200-feet depression extends from about two miles above the south-west end to within one and a half miles from the north-east end, and is eleven miles in length. The 100-feet depression approaches to within a quarter of a mile from the south-west end and one-third of a mile from the north-east end. Of the entire lake-floor, 30 per cent. is covered by less than 100 feet of water, 24 per cent. is covered by water with depths between 100 and 200 feet, 21 per cent. by water with depths between 200 and 300 feet, and 25 per cent. by water exceeding 300 feet in depth.

Loch Earn.

Loch Earn is nearly six and a half miles in length, over three-quarters of a mile in maximum breadth, and over half a mile in mean breadth; its superficial area is nearly four square miles, while it drains an area of nearly 55 square miles. The maximum depth is 287 feet, and the mean depth 138 feet, the volume of water being estimated at 14,421,000,000 cubic feet, sufficient to fill a cubical reservoir 811 yards (or nearly half a mile) in length, breadth, and depth. Loch Earn is of simple conformation, the deepest part being found approximately in the centre of the loch, though nearer the western than the eastern end. The depression, with depths exceeding 250 feet, is nearly two miles in length, extending from one and a half miles from the west end, to three miles from the east end, the maximum depth of 287 feet having been found about two and three-quarter miles from the west end, and three and three-quarter miles from the east end. The 200-feet depression is four and a half miles in length, stretching from three-quarters of a mile from the west end to a mile and a quarter from the east end. The 100-feet depression approaches to within less than a quarter of a mile from the west end, and less than half a mile from the east end, and is five and three-quarter miles in length. Of the entire lake-floor, 39 per cent. is covered by less than 100 feet of water, 31 per cent. is covered by water with depths between 100 and 200 feet, and 30 per cent. by water exceeding 200 feet in depth.

Loch Tummel.

Loch Tummel is two and three-quarter miles in length, the maximum breadth being half a mile, and the mean breadth over one-third of a mile, its superficial area being slightly less than one square mile; it drains an area of 62½ square miles. The maximum depth is 128 feet, the mean depth is 48 feet, and the bulk of water is estimated at about 1,317,000,000 cubic feet, *i.e.* a cubical reservoir 365 yards (or over one-fifth of a mile) in length, breadth, and depth would be required to contain the water in the loch. The floor of Loch Tummel is irregular, falling into three deep basins, separated by two shallow ridges, as already observed by Mr. Wilson. The deepest basin is situated near the west end of the loch, the maximum depth of 128 feet occupying a central position in this basin, but a short distance to the south a sounding of 74 feet is recorded in close proximity to a sounding of 127 feet. The central basin, separated from the western basin by a ridge with a maximum depth of 52 feet on it, is nearly half a mile in length, and has a

maximum depth of 119 feet. The eastern basin has a maximum depth of 99 feet, and is separated from the central basin by a rise with only 32 feet on it. The 50-feet depression is a continuous area stretching from within a quarter of a mile from the west end to less than 100 yards from the east end of the loch. Of the entire lake-floor, 37 per cent. is covered by less than 25 feet of water, 19 per cent. by water between 25 and 50 feet in depth, 34 per cent. by water between 50 and 100 feet in depth, and 10 per cent. by water exceeding 100 feet in depth.

Loch Eigheach.

Loch Eigheach is over three-quarters of a mile in length, the maximum width being less than a quarter of a mile, and the mean width one-tenth of a mile. It covers an area of less than one-tenth of a square mile, and receives the drainage from an area of nearly 14 square miles. The maximum depth is 28 feet, and the mean depth 6 feet, the bulk of water being estimated at 16,000,000 cubic feet, *i.e.* it would require a cubical reservoir 84 yards in length, breadth, and depth to hold the water in the loch. Loch Eigheach may be looked upon as three expansions of the River Gaoire, the south-western expansion being the shallowest (maximum 3 feet), the north-western expansion a little deeper (maximum 7 feet), and the eastern expansion the deepest, the maximum depth of 28 feet having been observed approximately in the centre, but nearer the east end than the west end, of this portion of the loch. Of the entire lake-floor, 91 per cent. is covered by less than 10 feet of water, and less than 2 per cent. exceeds 20 feet in depth.

Lochan Sròn Smeur.

This loch is over half a mile in length, nearly a quarter of a mile in maximum breadth, and one-seventh of a mile in mean breadth. It covers an area of less than one-tenth of a square mile, and drains an area of nearly two square miles. The maximum depth is 33 feet, and the mean depth over 10 feet, the cubic contents being estimated at 23,000,000 cubic feet, *i.e.* it would require a cubical reservoir 95 yards in length, breadth, and depth to contain the water of the loch. The loch is of simple conformation, but the deep water occurs in the eastern half, the maximum depth of 33 feet having been observed about one-eighth of a mile from the east end, while the western half is comparatively shallow. Of the entire lake-floor, 61 per cent. is covered by less than 10 feet of water, 27 per cent. by water between 10 and 20 feet in depth, and 12 per cent. by water exceeding 20 feet in depth.

Loch Laidon.

This loch is about five and one-third miles in length from north-east to south-west, but it sends out an arm towards the west, which is over one and a half miles in length, and a line following the axis of the loch from the north-east end to the extremity of the western arm would be over six miles in length. Its maximum breadth is nearly three-quarters of a mile, the mean breadth being about one-third of a mile, and its waters cover an area of over one and three-quarter square

miles; it drains an area of 30¼ square miles. The maximum depth is 128 feet, and the mean depth 35 feet, the cubic mass of water being estimated at about 1,762,000,000 cubic feet, *i.e.* it would require a cubical reservoir 403 yards (or nearly a quarter of a mile) in length, breadth, and depth to hold the water of the loch. Loch Laidon is of comparatively simple form, though with minor undulations of the lake-floor, the deepest water occupying the centre of the loch, where there is a depression three-quarters of a mile in length and over 100 feet in depth, the maximum depth of 128 feet having been observed about two and three-quarter miles from the south-west end and two and a half miles from the north-east end. Separated from this main 100-feet depression by shallower water, there is a sounding of 104 feet a short distance to the south-west, and half a mile further south there is an isolated sounding of 100 feet; there is also an isolated sounding of 100 feet a quarter of a mile to the north-east of the main depression. The principal 50-feet depression extends from less than a mile from the south-west end to less than one and a half miles from the north-east end, and is nearly three miles in length. Separated from this larger depression by an interval of a quarter of a mile is a smaller one, about one-third of a mile in length, situated in the north-eastern part of the loch, and nearly midway between them is an isolated sounding of 50 feet. The western arm of Loch Laidon is shallow and filled with rocks and boulders, the greatest depth observed being 17 feet in three different places. Of the entire lake-floor, 53 per cent. is covered by less than 25 feet of water, 21 per cent. is covered by water between 25 and 50 feet in depth, 22 per cent. by water between 50 and 100 feet in depth, and 4 per cent. by water exceeding 100 feet in depth.

Loch Bà, Lochan na h-Achlaise, Lochan na Stainge, and Loch Buidhe are shallow lakes, lying among glacial moraines in the Black Forest, covering together an area of over one and one-third square miles, and draining an area of 17½ square miles. They all flow into Loch Laidon, and form the true head-waters of the River Tay.

Loch Bà.

Loch Bà is over two miles in length, with a maximum breadth of over one mile and a mean breadth of less than half a mile, its superficial area being rather less than one square mile. The maximum depth is 30 feet, and the mean depth 8 feet, the cubic mass of water being estimated at 206,000,000 cubic feet, *i.e.* it would require a cubical reservoir 197 yards (or one-ninth of a mile) in length, breadth, and depth to contain the water in the loch. It is extremely irregular in form, studded with larger and smaller islands, and filled with rocks and boulders: the bottom contours are in consequence also very irregular. The deepest water occurs in the northern portion between the islands Eilean Molach and Eilean na h-Iolaire, where there is a small depression less than a quarter of a mile in length and over 20 feet in depth, the maximum depth of 30 feet having been observed about one-sixth of a mile to the north of the northern point of Eilean Molach. An isolated

sounding of 20 feet was taken close to the western shore of the southern portion of Eilean Molach. There are three irregular depressions with depths exceeding 10 feet, the central one enclosing the 20-feet depression and extending on both sides of Eilean Molach and to the west and north of Eilean na h-Iolaire, the southern one occupying the wide south-eastern portion of the loch, and the third situated in the north-eastern extension of the loch. Of the entire lake-floor, no less than 71 per cent. is covered by less than 10 feet of water, and only $1\frac{1}{2}$ per cent. exceeds 20 feet in depth.

Lochan na h-Achlaise.

This loch is over four-fifths of a mile in length, the maximum width being three-quarters of a mile, and the mean width over one-third of a mile. The maximum depth is 28 feet, the mean depth $9\frac{1}{2}$ feet, and the bulk of water about 76,000,000 cubic feet, *i.e.* it would require a cubical reservoir 141 yards (or less than one-twelfth of a mile) in length, breadth, and depth to contain the water in the loch. This loch is also irregular in outline and studded with islands. The deep water occurs in the eastern larger half of the loch, the western portion being all less than 10 feet in depth, except for one isolated sounding of 11 feet. The 10-feet depression approaches close to the southern shore and to the shore of the large island in the north-eastern part of the loch, and is over half a mile in length. It encloses two 20-feet depressions, the larger one irregular in shape and separated from the smaller one by a sounding of 18 feet. The maximum depth of 28 feet was observed about one-eighth of a mile from the eastern shore. Of the entire lake-floor, 63 per cent. is covered by less than 10 feet of water, and only 9 per cent. exceeds 20 feet in depth.

Lochan na Stainge.

This loch is over half a mile in length, the maximum breadth being two-fifths of a mile and the mean breadth over one-seventh of a mile. The maximum depth is 14 feet, and the mean depth 5 feet, the cubic contents being about 11,000,000 cubic feet, *i.e.* it would require a cubical reservoir 74 yards in length, breadth, and depth to contain the water in the loch. The loch is shallow (all under 8 feet in depth), except for two soundings of 12 feet and 14 feet near the central constriction in the outline of the loch.

Loch Buidhe.

Loch Buidhe is about one-third of a mile in length, nearly a quarter of a mile in maximum width, and nearly one-sixth of a mile in mean width. It is very shallow, the deepest water found by the Lake Survey being 3 feet, and the bulk of water is estimated at 2,000,000 cubic feet, *i.e.* it would require a cubical reservoir 42 yards in length, breadth, and depth to contain the water in the loch.

Loch Lyon.

Loch Lyon is about one and three-quarter miles in length, the

maximum breadth being a quarter of a mile, and the mean breadth one-fifth of a mile, the superficial area being over one-third of a square mile; it drains an area of 10½ square miles. The maximum depth is 100 feet, the mean depth 45 feet, and the cubic mass of water about 460,000,000 cubic feet, *i.e.* it would require a cubical reservoir 258 yards (or one-seventh of a mile) in length, breadth, and depth to contain the water in the lake. The loch forms a simple basin, the deep water approaching much closer to the south-western than to the north-eastern end. The maximum depth of 100 feet was observed in the centre of the loch; the 75-feet depression is over one mile, and the 50-feet depression over one and a quarter miles, in length. Of the entire lake-floor, 39 per cent. is covered by less than 25 feet of water, 15 per cent. by water between 25 and 50 feet in depth, 24 per cent. by water between 50 and 75 feet in depth, and 22 per cent. by water over 75 feet in depth.

Loch Iubhair.

Lochs Iubhair and Dochart may almost be looked upon as one lake, Loch Iubhair receiving the outflow from the smaller loch by a river less than half a mile in length; together their waters cover an area of over a quarter of a square mile, and they drain an area of 44½ square miles. Loch Iubhair is over one and one-third miles in length, one-third of a mile in maximum breadth, and nearly one-sixth of a mile in mean breadth. The maximum depth is 65 feet, and the mean depth 25 feet, the bulk of water being estimated at 147,000,000 cubic feet, *i.e.* it would require a cubical reservoir 176 yards (or one-tenth of a mile) in length, breadth, and depth to hold the water in the loch. It is peculiar in form, somewhat like the italic letter *f*, with a constriction in the central portion. The deepest water occurs in the north-eastern part, where the loch is widest, the maximum depth of 65 feet having been observed approximately in the centre of this portion of the loch. The bottom rises on approaching the central constriction, the greatest depth in which is 36 feet, and falls again as the loch widens out towards the south-west, the maximum depth in this part of the loch being 49 feet. The 25-feet depression is over a mile in length, approaching close to the northern shore, but distant about a quarter of a mile from the southern end of the loch. Of the entire lake-floor, 53 per cent. is covered by less than 25 feet of water, and only 3 per cent. exceeds 50 feet in depth.

Loch Dochart.

Loch Dochart is over half a mile in length, the maximum breadth being one-sixth of a mile, and the mean width over one-tenth of a mile. It is quite shallow, the maximum depth being 8 feet, and the mass of water is estimated at 8,000,000 cubic feet, *i.e.* it would require a cubical reservoir 67 yards in length, breadth, and depth to contain the water of the loch. The deepest water occurs near the south-west end.

Loch Treig.

Many speculations have been indulged in regarding the depth of Loch Treig, some people maintaining that its depth exceeded 1000 feet,

others declaring that it had no bottom. Loch Treig is also specially interesting because of its connection with the origin of the parallel roads of Glen Roy. The ice which came down the valley now occupied by the waters of the loch into the valley of the Spean is supposed to have dammed up the mouth of Glen Roy, and to have been the cause of the parallel roads. Loch Treig, which trends in a NNE. and SSW. direction, is over five miles in length, and three-quarters of a mile in maximum breadth towards the southern end, whence it narrows gradually, though irregularly, towards the northern extremity, its mean breadth being nearly half a mile. Its waters cover an area of nearly two and a half square miles, and it drains an area of nearly 43 square miles. The cubic mass of water is estimated at 13,907,000,000 cubic feet, *i.e.* it would require a cubical reservoir 802 yards (or nearly half a mile) in length, breadth, and depth to contain the water of the loch. It forms a simple basin, the deepest water being found in the centre of the loch, where there is a long narrow depression nearly two miles in length, in which the depth exceeds 400 feet, the maximum depth observed by the Lake Survey being 436 feet, towards the southern end of this depression and nearly two miles from the southern end of the loch. The 300-feet depression is nearly three miles in length, stretching from within a mile and a half from the northern end of the loch to less than a mile from the southern end. The 200-feet depression is nearly four and a half miles in length, approaching to within less than half a mile of the northern end and a quarter of a mile of the southern end. Of the entire lake-floor, 27 per cent. is covered by less than 100 feet of water, 48 per cent. by water between 100 and 300 feet in depth, and 25 per cent. by water exceeding 300 feet in depth. These figures show that Loch Treig is a very deep lake considering its superficial area, the mean depth being computed at about 207 feet. This exceeds the mean depth of Loch Tay, Loch Ericht, and Loch Katrine, which have all a greater maximum depth than Loch Treig.

Loch Ossian.

Loch Ossian is three and one-fifth miles in length, and about half a mile in maximum breadth, the mean breadth being one-third of a mile. Its waters cover an area of over one square mile, and it receives the drainage from an area of 10½ square miles. The maximum depth is 132 feet, and the mean depth 42¾ feet, the volume of water being estimated at 1,224,000,000 cubic feet, *i.e.* it would require a cubical reservoir 357 yards (or over one-fifth of a mile) in length, breadth, and depth to contain the water in the lake. The floor of Loch Ossian is rather irregular, the deeper water being contained in the eastern half of the loch. About one and a quarter miles from the west end there is a rise in the bottom covered by less than 25 feet of water, the shoalest water on which is 11 feet, and the contour-lines in the vicinity of this rise are very irregular. The depression with depths exceeding 100 feet is half a mile in length, and is situated about three-quarters of a mile from the east end, and nearly two miles from the west end. About a quarter of a mile from the east end there is a depression with a maximum depth of 78 feet,

separated from the main depression by a ridge on which the maximum depth is 41 feet. The main 50-feet depression is two miles in length, extending from about one-third of a mile from the east end to less than one mile from the west end. Of the entire lake-floor, 32 per cent. is covered by less than 25 feet of water, 36 per cent. by water with depths between 25 and 50 feet, 27 per cent. between 50 and 100 feet, and 5 per cent. by water exceeding 100 feet in depth.

Loch Tulla.

Loch Tulla is two and a half miles in length, the maximum width being rather less than a mile, the mean width nearly half a mile, and it covers an area of over one square mile: it receives the drainage from an area of over 49½ square miles. Its maximum depth is 84 feet, and its mean depth 38 feet, the cubic mass of water being estimated at 1,167,000,000 cubic feet, *i.e.* it would require a cubical reservoir 351 yards (or one-fifth of a mile) in length, breadth, and depth to contain the water in the lake. It is of simple conformation, except that a small depression with depths exceeding 50 feet occurs to the south-west of the island Eilean Stalchairichd, separated from the larger deep portion of the loch lying to the north-east of that island, where there is a depression three-quarters of a mile in length, and over 75 feet in depth, the maximum depth of 84 feet having been observed near the southern end of this depression, and a quarter of a mile from the island. Of the entire lake-floor, 37 per cent. is covered by less than 25 feet of water, 31 per cent. by water between 25 and 50 feet in depth, and 32 per cent. by water exceeding 50 feet in depth.

The number of soundings taken in a lake varies according to its size and conformation, relatively fewer soundings being necessary, as a rule, in a large lake than in a small one. For instance, in Loch Bà, with a superficial area of less than one square mile, 315 soundings were taken, and in Loch Tulla, with a superficial area of rather more than one square mile, 318 soundings were taken, whereas in Loch Earn, with a superficial area of nearly four square miles, 499 soundings were taken, and in Loch Tay, with a superficial area exceeding ten square miles, 924 soundings were taken. This gives an average of 91 soundings per square mile in Loch Tay, 128 soundings per square mile in Loch Earn, 289 soundings per square mile in Loch Tulla, and 350 soundings per square mile in Loch Bà. In the sixteen lakes dealt with in the preceding paragraphs, which cover an area of over twenty-three and a half square miles, nearly 4000 soundings were taken, or an average of 165 soundings per square mile.

In making the planimeter measurements and calculations regarding these lakes, the writer of this article has been assisted by Mr. D. C. M'Intosh, M.A., and Mr. Robert Dykes.

GEOGRAPHY AND THE WAR OFFICE.

THE Report of the Committee appointed by the Secretary of State for War to consider the education and training of officers of the British Army, which was recently published as a Blue Book, deals *inter alia* with the subject of Geography. After the slight recognition which that science has as yet received from the Scottish Universities, it is not surprising to learn that it has been considerably neglected in the studies of our military officers. The present writer has a vivid recollection of hearing a young English Cavalry officer quartered in Edinburgh tell of a topographical sketch of that district which he had been ordered to make by his commanding officer. The writer asked him whether he had indicated on his sketch the height of Arthur's Seat? "Of course I did," he replied. "I suppose," the writer continued, "you set it down at 800 feet or so?" The officer's face evidently showed that he thought he was being fooled, for he answered with some warmth, "Certainly not!" "May I ask," inquired the writer, "what you gave as the height of Arthur's Seat?" "3000 feet," was the emphatic reply.

It is gratifying to learn from the Report of the War Office Committee, which is a unanimous one, that "they have no hesitation in insisting that a knowledge of English as tested by composition, together with an acquaintance with the main facts of the history and *geography* of the British Empire, ought in future to *hold the first place* in the examination, and to be exacted from all candidates. Every officer in His Majesty's Service ought, in their opinion, to be able to express himself clearly and correctly in his own language, and to have a reasonable knowledge of the outlines of the history and literature of his country, and of the *geography* connected with it. They are aware that it is said that history and geography lend themselves most easily to cram, but they believe that with some care in the method and conduct of the examination this danger may be avoided."

Thus, if the War Office gives effect to the unanimous finding of its own Committee, it will in future include "the main facts of the geography of the British Empire" as a *compulsory* subject of examination of *first* importance for all military candidates. When we add that the Committee contained such high educational authorities as the Rev. Dr. E. Warre, D.D., M.V.O., Headmaster of Eton College; Mr. F. W. Walker, Headmaster of St. Paul's School, London, W., and Major-General R. H. Jelf, C.M.G., R.E., now Governor of the Royal Military Academy, Woolwich, it will be admitted that the inclusion in the curriculum of Geography as a compulsory subject of first importance is a very satisfactory circumstance. If effect is given to this recommendation, it will act as a spur to our Scottish Universities, for the Committee add that the military authorities are most anxious to receive University Candidates, and that "the great Universities of the United Kingdom have professed their willingness to make such alterations in their courses of study as may be considered desirable by the military authorities, stipulating only that the number of Commissions offered to University Candidates should be

increased, and that there should be some finality about the amended regulations."

With regard to future examinations for entrance to the Military Academies at Woolwich and Sandhurst, and for the literary qualification of Militia and Yeomanry candidates, the Committee recommend as the first subject of Class I. (compulsory, with a disqualifying minimum) that 3000 marks be given for "English.—Composition, Precis, Outlines of English History, and General Geography, with special reference to the British Empire." The setting of a vast subject like "General Geography," with the addition of the words "with special reference to the British Empire," is somewhat contradictory, and will give trouble to candidates, but the Committee cast some light on what they mean by adding, "The Committee are of opinion that the questions should test the candidate's general knowledge of the geography of the British Empire, as well as his general acquaintance with its products and exports." Even this is not a well-expressed sentence.

The Committee show that there is absolutely no reason why military candidates should not be examined in Geography, seeing that that subject is included in the preliminary examinations of candidates for so many other professions, and that the chief anxiety of our British military authorities now is, that military officers shall not fall below the intellectual level of members of other professions.

From an appendix to the Committee's Report, we learn that the following professional bodies include Geography in their preliminary examinations, viz.,

Incorporated Law Society (Chancery Lane, W.C.), for Solicitors.	Geography of Europe.
Institute of Chartered Accountants (Moorgate Place, E.C.), . .	Geography of Great Britain and Europe.
Society of Accountants (4 King Street, E.C.), ...	Geography.
Royal Institute of British Architects (9 Conduit Street, W.), .	Do.
Institute of Civil Engineers (Great George Street, W.C.), . .	Do.
Naval Cadets, ...	Geography of British Empire.
Civil Service: Inland Revenue, .	Geography.

As the Committee point out, His Majesty William II., German Emperor, with that intellectual alertness which always distinguishes him, recognised the necessity of his military cadets knowing Geography, by issuing from Berlin an order, dated 14th February 1890, in which he "increased and rendered more thorough" the curriculum of study in the cadet corps. The following paragraph relates to the subject of Geography: "The geographical instruction, both political and physical, must be made to exemplify and support the historical studies. Its further object is, that the student will know thoroughly all about the geography of his own country and its peculiarities, and also understand and appreciate that of foreign countries." It will be observed that His Majesty's idea of the geographical education required by military cadets

is considerably wider than that of the War Office Committee, for whilst the latter are chiefly concerned with army candidates having "an acquaintance with the main facts of the geography of the *British Empire*," His Majesty insists that his military cadets shall not only know "thoroughly all about the geography of their own country and its peculiarities," but also "understand and appreciate that of *foreign* countries."

The Committee strengthen their advocacy of geographical instruction by giving the opinion of educational experts. Thus, Major W. H. James, R.E., a celebrated army tutor, states that "the value of History and Geography as an educational medium is universally admitted, *except in England*. The absolute ignorance of Officers of the History of their country much hinders their study of military history, while their want of knowledge of Geography is also detrimental to it." Another eminent army tutor, Dr. T. Miller Maguire, M.A., considers that "Modern Geography, especially that of our Empire," should be an obligatory subject. He emphasises *Modern* Geography apparently, as he holds that the study of Ancient Classics and Geography by army candidates has been quite overdone. Again, Mr. J. S. Phillpotts, Headmaster of Bedford Grammar School, expresses himself as follows with regard to the geographical instruction of military candidates: "As to Geography, any one ought to know some as a matter of instruction rather than of education, but no subject is so soon forgotten. Moreover, when the need of Geography arises, a far more detailed knowledge is required than could ever be given in school, and the interest then quickens the memory. I do not rate the educational value of Geography highly; if treated scientifically it becomes a branch of Physiography, but this is probably not what is desired. An officer wants Topography much more than Geography, but both should be taught in the Military Colleges in connection with Military History." However rambling Mr. Phillpotts's argument may be, it is satisfactory to find that he arrives at the conclusion that both Topography and Geography should be taught in the Military Colleges in connection with Military History.

As a contribution to the advancement of British military education, the value of the War Office Committee's Report cannot be overrated, and, considering the grave defects exposed by the Committee, and the dearly-bought lessons of the Boer war, we can only hope that the recommendations contained in the Report will be given effect to without delay.

SCOTTISH NATIONAL ANTARCTIC EXPEDITION.

THIS expedition will sail from the Clyde early in September. The ship secured for the expedition is a whaler, which is being entirely reconstructed and strengthened by the Ailsa Shipbuilding Company at Troon, under the guidance of Mr. G. L. Watson. She is a barque-rigged auxiliary screw-steamer of about 400 tons register,

measuring 140 feet in length, 29 feet in breadth, and having a depth of 15 feet. She is to be called the *Scotia*, a name which will at once distinguish her in any quarter of the globe. The *Scotia* is excellently fitted for the work she has to undertake, being immensely strong, in spite of which her lines are exceedingly graceful. New deck-houses are being built—a larger one aft for the leader, the captain, and the scientific staff, and a smaller one forward, which is divided into a scientific laboratory and a cook's galley. A second scientific laboratory is to be found 'tween decks, as well as a photographic dark-room. These and the second officer's mess-room lie just below the deck laboratory. Very comfortable quarters are also being provided for the crew. A speed exceeding seven knots is aimed at with the new boiler and engines which are being placed in the ship.

The route is precisely that indicated in the original plan of the expedition. A course being steered direct for the Falkland Islands, at Port Stanley the expedition will spend a few days taking fresh meat and coal on board, and it is hoped that the Admiralty will help the Scottish Expedition by supplying the coal. From Port Stanley, the expedition will sail 1000 miles to the eastward, and after investigating the Sandwich groups will strike to the southward. This route has special interest for Scotsmen, for the only man who has visited this part of the South Polar regions is Captain James Weddell, who, sailing from Leith in 1823, attained a higher latitude than any of his predecessors. Both the German ship *Gauss* and the British ship *Discovery* have been specially built for magnetic work, and will have to make great sacrifices to carry out that most important work effectively. Both are frozen up at the present time in the ice during the Antarctic winter. Mr. Bruce's opinion is that a free moving ship constantly doing work of the *Challenger* type for a whole year, both within and without the Antarctic circle, is the greatest present need. The chief work, therefore, of the Scottish expedition will be oceanography. Meteorology will also be an outstanding feature of the expedition. Geological, zoological, botanical research will be actively pursued during the whole voyage, and the study of bacteriology will form a new field of investigation in the Polar regions. As occasion arises land journeys of short duration will be undertaken for the purpose of topographical and other investigation.

If the ice conditions in the Weddell Sea prove favourable, Mr. Bruce will push southward as far as is prudent, just as Weddell did. But in no case is it his intention to allow the ship to be frozen in the ice, as its sphere of utility becomes at once limited, and the gain is not commensurate with the risks involved. Particular care will be devoted to the investigation of the region in 68° 34′ S., 12° 49′ W., where Ross got the oft-quoted and much-disputed soundings of "4000 fathoms no bottom." To see if the great "Deep" discovered by the *Valdivia* between Bouvet Island and Enderby Land extends far towards the westward will also be an object demanding especial care. For this purpose a Lucas sounding machine will be used, and observations on the currents, temperature, salinity, and density of the sea, from the surface to the bottom, will be made. Elaborate preparations are being made on board

for the special study of marine biology. Two great drums, each containing 6000 fathoms of wire, are being constructed for trawling and trapping at great depths, and a great variety of nets is being taken to secure animals and plant life from the surface and intermediate depths. Whales and seals will be carefully studied, and special gear for securing these will be on board; it is hoped that a unique collection of this material will be brought together. With regard to meteorology, hourly observations will be taken during the whole time the expedition is away, three members of the staff having gained exceptional experience in meteorological work at the Ben Nevis Observatories.

The equipment for this investigation is very complete. The exploration of the upper air by means of kites, carrying meteorographs, will be pursued at sea, a special engine being provided for reeling in the kite wire. The experiments at present being carried out in the Clyde by Mr. John Anderson on board the s.y. *Mermaid*, kindly lent by the directors of the Millport Marine Biological Station, have proved entirely satisfactory. The success of this valuable innovation in meteorological methods is thus assured.

The attainment of this object has not been accomplished without a hard struggle, and even now at the last moment, as is generally known, Mr. Bruce has been left face to face with the problem of having to raise more money when he should be relieved entirely of such work, and be able to concentrate his whole attention on the organisation of the expedition. He therefore appeals to all Scotsmen to come forward and follow the example set by others of their countrymen, and so enable the equipment and scale of the expedition to be a credit to Scotland.

ROYAL SCOTTISH GEOGRAPHICAL SOCIETY.

Notice to Members.

The Society's Rooms in Edinburgh will be closed for cleaning during the month of August.

GEOGRAPHICAL NOTES.

AFRICA.

Geography of Kikuyu. In the *Geographical Journal* Major Richard Crawshay gives a most interesting account of the country, people, fauna, and flora of this portion of the East Africa Protectorate. It lies between the parallels of latitude 0° 0′ and 1° 45′ South, and longitude 36° 30′ and 37° 15′ East, and at an altitude varying from 1500 to 18,600 feet, the last the height of the mountain Kilinyatha. Fort Smith, the settlement, stands at an altitude of 6400 feet, and is surrounded by open and cultivated country. The staple food of the natives is the sweet potato, but they also grow four kinds of beans, several millets, sorghum, maize, sugar-cane, and an edible arum. At higher altitudes than Fort Smith the yam is grown in great abundance and with very marked success. Major Crawshay

speaks highly of the climate, in which a European can not only live in health and comfort, but can also perform all sorts of manual labour in the open. The soil is rich and fertile, water is abundant, most of the tropical animal pests are absent, except for red ants, and the natives are a fine and intelligent race. They are pugnacious among themselves and disposed to be hostile to strangers, but are very manageable if fairly treated at the outset. They are primarily a pastoral people, in spite of the extent to which agriculture is practised. In regard to the latter the heavy work of clearing is done by the men, but the women and children plant, weed, and harvest the crops. Bees are not domesticated, but wooden cylinders are placed in suitable trees for the wild bees, and special trees are also planted for them. From the honey the natives brew an intoxicating drink, drunkenness being their chief vice.

Not only are the Akikuyu of exceedingly fine physique, but deformities are practically absent. The infants are carried about by their mothers slung in a skin at the back, and are thus out in the open all day long. The adults eat no flesh save that of their domesticated animals, and the author gives a charming picture of the consequent fearlessness of the wild birds and animals. As showing the nature of the climate he mentions that he was very successful with many European plants, even rhubarb and Alpine strawberries, as well as all the common vegetables. Others have succeeded well with such flowers as sweet peas, stocks, dahlias, and pansies. Finally, to this list of Kikuyu's charms must be added that it is a naturalist's paradise, with a fauna which in many groups still remains to be worked out.

Nile Dams and Reservoir.—Sir Benjamin Baker delivered a lecture at the Royal Institution on this subject on June 6th last, in which he pointed out that all that can be hoped for in Egypt is the extension of the narrow strip of green running along the banks of the Nile, and the rendering of the low-lying lands generally more productive by a more abundant supply of water. No irrigation works would ever render fertile the desert lands of Egypt, but the effect of the present works will be to give a larger water-supply in summer to the low grounds, so that some 300,000 acres of additional land can be brought under cultivation, and the labour of lifting water will be diminished. Sir Benjamin then described the dam at Aswân and the great barrage at Asyût, 250 miles above Cairo.—*Times.*

Cold in South Africa.—Abnormally cold and stormy weather has recently been experienced in South Africa. At Middleburg, Cape Colony, the ground for the first time in sixteen years was covered with deep snow on June 11th. Throughout the colony generally the temperature has been abnormally low, and thousands of sheep and cattle have perished. A very severe snowstorm swept over the midland districts of the colony on June 14th, the trains being blocked at Naauwpoort by a drift six feet deep.—*Nature.*

AMERICA.

Fluctuations of Water Level on Lake Erie.—Professor A. J. Henry publishes as *Bulletin J* of the *United States Weather Bureau* the results of a prolonged series of observations on the influence of the velocity of the wind on the surface of the water in this lake. The prevailing winds on the lake are westerly, the proportion varying with the season of the year, and differing at different points of the lake. As the result of the action of the winds on the surface of the lake, currents are produced like those similarly produced in the ocean, but of much less magnitude. When a strong westerly gale prevails, the water is in consequence banked up on

the eastern shore, and, as it cannot escape by the river outlets, nor return as a surface current, it must escape downward and westward as a return current beneath the surface. There are thus produced variations of the water-level of the lake which are a serious danger to navigation. As the action of the wind in the case mentioned above has resulted in the destruction of the condition of hydrostatic equilibrium which existed before the wind began, it is found that the lake tends to return to a state of stable equilibrium soon after the maximum force of the wind has been exerted. This is effected by means of a series of rocking movements of the whole water of the lake, about a nodal line passing through the centre of the lake, the water at either end alternately rising and falling until a condition of rest is attained. This series of rocking movements constitutes a "seiche." On Lake Erie the seiches are of great amplitude, a difference of level of 13 feet 1 inch between the two ends of the lake having been noted. Seiches of great amplitude rarely occur in summer, and are only known in connection with westerly gales, having a velocity of 40 to 50 miles an hour. Strong easterly winds are rare on the lake, and the greatest lowering of the water they produce is probably between five and six feet. On the other hand, it is remarkable that an easterly wind of relatively low velocity will produce a well-marked seiche. In addition to the great seiches of stormy weather, numerous small fair-weather seiches occur, especially in the warm season, whose cause it is somewhat difficult to determine.

In connection with Professor Henry's work, it is interesting to note the discovery during the Scottish Lake Survey of a small seiche in Loch Treig, in Inverness-shire. Here the amplitude was very small, not more than $\frac{3}{16}$ inch, but the regularity of the oscillation was very marked. The observation was made by Dr. T. N. Johnston and Mr. J. Parsons, and is the first time a phenomenon of the nature of a seiche has been observed in a Scottish loch (cf. p. 415).

The West Indian Eruptions.—A considerable mass of material has now come to hand relating to the volcanic outbursts in Martinique and St. Vincent. In *Nature* of June 12th there is an interesting article by Professor Milne on the connection between seismic shocks and outbursts of volcanic activity, in which he points out the probability that it was the relief in seismic strain due to the severe earthquakes which did so much damage in Guatemala on April 19th, which was the proximate cause of the great West Indian eruptions. While it is true that, as occurs in Japan, innumerable minor earthquake shocks may occur without being followed by any form of volcanic activity, yet a chronological study of events in the past in the West Indian region shows that during the last two hundred years volcanic outbursts have been preceded by severe seismic shocks. On the whole, it may be said that the Antillean ridge marks a line of weakness characterised by its extreme instability, and its correlated susceptibility to seismic disturbances originating at a distance.

Another interesting point in connection with the eruptions is that for the first time on record a volcanic outburst caused magnetic disturbance of such magnitude that it was recorded by needles at distances of 2000 and 5500 miles from the disturbed area. According to the *National Geographic Magazine*, the magnetic needles at Cheltenham (near Washington, U.S.A.), at Baldwin (Kansas), and in the Hawaiian Islands were disturbed at times which corresponded exactly with the time of the eruption at St. Pierre on May 8th. A similar disturbance occurred on May 20th at the time of the second eruption. Though proof of the connection of the two phenomena is as yet wanting, the coincidence in time is at least a very remarkable fact. The effect on the magnetic needles was distinctly magnetic in

character, the needles being pulled away from their usual direction for many hours, and was not merely mechanical, as was, for instance, that caused by the earthquakes in Guatemala.

As to the immediate cause of the sudden death of the inhabitants of St. Pierre, very divergent opinions have been expressed. One of the most interesting of these is due to M. A. Taquin, who in the *Revue Scientifique* brings forward his reasons for believing that the people were killed instantaneously by electricity. M. Taquin believes that the study of the manifestations of terrestrial electricity in volcanic districts would afford a means of predicting eruptions, which are, he considers, immediately caused by high tension terrestrial electricity. In a subsequent number of the same Journal (June 21st), M. A. de Lapparent strongly opposes M. Taquin's views. He considers that the view that the inhabitants of St. Pierre were electrocuted is contradicted by the facts that individuals sheltered within thick walls were saved, and that the crew of the *Roddam* suffered only from the fall of incandescent stones. Further, the suggestion that electricity is the cause of volcanic phenomena seems to be contradicted by the fact that in the greatest volcano of the globe—Mauna Loa—the lava flows out quietly without any manifestations of electrical force.

POLAR.

Royal Geographical Society's Antarctic Relief Expedition.—The *Morning*, the vessel purchased as the Antarctic Relief ship, set sail on Wednesday, July 9th, under the charge of Captain Colbeck. She will touch only at Madeira on her voyage to Lyttelton, New Zealand, and will there refit and take in supplies. Thence she will travel through the ice-pack to Cape Adare, in Victoria Land, where news may be obtained of the *Discovery*. Captain Scott undertook, so far as possible, to leave records of his progress within zinc cylinders at Cape Adare, Possession Island, Coulman Island, Wood Bay, Franklin Island, Cape Crozier, and at that spot on the Ice Barrier where Mr. Borchgrevink succeeded in landing. The *Morning* will endeavour to visit all these places, and may possibly find the *Discovery* herself during her passage along the east coast of Victoria Land. If this happens, Captain Colbeck is to place himself under the command of Captain Scott, and after working in conjunction with him during the navigable season, the two vessels are to return to Lyttelton in the spring of the next year. If, however, the relief expedition fails to encounter Captain Scott, then its work will be limited to the founding of depôts of provisions at Cape Crozier, Cape Adare, and Wood Bay. This done, the *Morning* will return to New Zealand, and make a fresh journey in the following spring. But in regard to the details much has been left to Captain Colbeck's discretion.—*Scotsman*.

Expedition to New Siberia.—On April 19, 1901, M. Vollosovitch, with assistants, left Ustiansk, on the delta of the Yana, with instructions to proceed to the relief of the *Zaria* expedition. After experiencing great difficulty in the crossing of the tundra, M. Vollosovitch's party reached C. Sviatoi, and thence made their way successively to Liakov, Kotelnoy, Fadeief, and New Siberia. Depôts of provisions were established on all these islands, and important palæontological collections were made. In the eastern part of Kotelnoy, rocks of Devonian age were observed, while in other parts beds of lignite of Jurassic age were found, and proved to be very rich in plant impressions. Elsewhere the region is made up of Tertiary and post Tertiary beds. During September the expedition found the *Zaria* anchored on the western coast of Kotelnoy and already blocked with ice. After passing a portion of the winter with M. de Tolt,

the commander of the *Zarya*, the expedition left on February 27th, and safely regained Irkutsk.—*La Géographie*, v.

American North Polar Expedition.—The auxiliary ship of this expedition—the *Fridtjof*—left Tromsö on July 1st to take coals to the *America*, and bring back news of Mr. Baldwin. She is taking a special equipment of stores, dogs, etc., for ice-travel, and if there should be no news of Baldwin, will leave a small party of men in Franz-Josef Land, as far north as possible, with the object of following up any trace of the exploring party. If Baldwin has succeeded in his dash for the Pole, it is expected that he will be returning, and will be met by the *Fridtjof*, which will return with him.—*Scotsman*.

GENERAL.

Expeditions to Martinique.—Among the expeditions which have been sent to the West Indian Islands to investigate the volcanoes and volcanic phenomena of these regions, is one under the auspices of the *National Geographic Society* (Washington, U.S.A.). The party consists of three members, Mr. R. T. Hill of the U.S. Geological Survey, Professor I. C. Russell of the University of Michigan, and Commander C. E. Borchgrevink, the Antarctic explorer. The expedition sailed from New York on May 14th on board the *Dixie*, which carried supplies to the sufferers of the recent eruptions. The *Dixie* arrived in Martinique on May 21st, some hours after the second great eruption of Mount Pelée, and was there joined by other scientists, notably by Professor Angelo Heilprin, who, with three guides, succeeded in ascending Mount Pelée on May 31st. Some of the results obtained by Professor Heilprin and other members of the party are recorded in the *National Geographic Magazine* for June, from which this note is taken.

The *Académie des Sciences* has also sent an expedition to Martinique, consisting of M. A. Lacroix, M. Rollet de l'Isle, and M. J. Giraud, who left France on the 9th of June for the West Indies.

Scientific Expedition to North Atlantic.—The Prince of Monaco, during last year, conducted from his yacht, the *Princesse Alice II.*, a series of soundings in the North Atlantic, his course including the space between Gibraltar and 12° 5′ of North Latitude. The zoological results were particularly rich, and soundings undertaken from depths of 5380 metres to those of 6400 metres showed that the abyssal clay, which was first green and then red, is produced by the progressive chemical destruction of all the mineral débris, of organic or inorganic origin, which sinks from the surface to the bottom. Near the Cape Verd islands the sea presented a remarkable colour, which proved to be due to the presence of an enormous number of Peridinea.—*La Géographie*, v.

Geography at Oxford.—The University of Oxford offers a scholarship in Geography, the examination for which takes place on Tuesday, October 14, 1902. Candidates must have taken Honours in one of the Final Schools of the University, and the Scholar elected will be required to attend the full course of instruction at the School of Geography during the academic year 1902-1903, and to enter for the University Diploma in Geography in June 1903. The following books are given as indicating the range of the examination: Dryer's *Lessons in Physical Geography*, Geneo's *Relations of Geography and History*, Mackinder's *Britain and the British Seas*. In the questions set the interests of students who have devoted attention to History or to Natural Science in their geographical aspects will be specially considered.

The Regulations for the University Diploma in Geography at Oxford have been recently revised, and are now so arranged as to meet the requirements of different classes of students. Eight subjects for examination are recognised, and of these the candidate is expected to offer three, of which Regional Geography must be one. The other seven subjects are Climatology and Oceanography, Geomorphology, Ancient Historical Geography, Modern Historical Geography, the History of Geography, Topographical Surveying and Mapping, Geodetic Surveying and Mapping.

The Société de Géographie's Competitions for 1902 and 1903.—The subject for the 1902 competition is a geographical study of the regions of Tarentaise, Maurienne and Briançonnais in the French Alps, from the point of view of human life. The essays must be sent in by December 31st, and the prizes will be awarded at the meeting in April 1903. For 1903 three subjects are prescribed: (1) The explanation of the physical peculiarities of some natural region of France; (2) the history of the graphic representation of a French province; (3) an investigation of the extent to which water-power is utilised in France, with suggestions as to improvements in this respect. These essays must be sent in by December 31, 1903. Full particulars can be obtained from the Société de Géographie.

We have received from Mr. M. A. M. Mizzi a little pamphlet entitled *A Voice from Malta*, in which the author gives some account of the history and geography of the Maltese Islands, together with a more detailed discussion of the origin, characters, and relations of the Maltese language.

From the agents of the Southern Pacific Company we have received a handsome framed photograph, in two colours, of "Grizzly Giant," one of the Californian Big Trees, discussed in recent numbers of the *Magazine*.

COMMERCIAL GEOGRAPHY.

Economic Position of Germany.—Mr. G. E. Barnett regards the rapid growth of the population of Germany as one of the most remarkable features in its remarkable political and economic development during the last thirty years. Since 1870 the population has increased from 40,000,000 to 55,000,000, and in 1898 the annual rate of increase was 14·6 per thousand, a rate greater than that of any European state save Holland. As contrasted with the British Empire, Russia, and the United States, Germany is characterised by the fact that neither within the mother colony, nor in the colonies, is there a natural outlet for the surplus population—the two and a half millions of her citizens which have emigrated since 1870 have ceased to be Germans. In consequence, the increase in the population has had to be provided for at home, *i.e.* by the conversion of the empire into an industrial state, a country increasingly dependent on foreign trade for food and raw material. While in 1840 the agricultural population of Germany amounted to three-fourths of the whole, in 1900 it was only one-third. With the exception of Great Britain, the great powers are committed to a policy of protection. France and the United States are in consequence virtually closed to German goods, and Russia, with the development of its manufacturing industries, must soon become economically independent. The need of Germany for foreign markets is more clamant in that a serious check to the sale of her manufactured goods would mean the emigration of her people and the loss of political prestige, and she must therefore struggle for the smaller markets against Britain and the United States.—*John Hopkins University Circulars.*

The Isthmian Canal.—Mr. A. P. Davis gives an interesting summary of the respective advantages possessed by the Nicaragua and Panama routes for the Isthmian canal. In regard to Panama, the advantages are that it is shorter (49 miles as against 184), and that for this and some other reasons it would be cheaper to maintain and operate, and would require less time for passage. Again, it has fewer curves, and these of longer radius, fewer locks, and is shorter by several hundred miles from ports of western South America to all other points, the voyage to which would include the Isthmian Canal. On the other hand, the advantages of the Nicaragua route are that it is several hundred miles shorter than the Panama route on all voyages of which both termini are in the Northern Hemisphere—for instance, from San Francisco to New Orleans, New York, or Liverpool, and from North America to Asiatic ports. Again, the constant trade-winds afford better facilities for the approach and departure of sailing vessels than Panama can offer, and the canal route passes through an unsettled region of large extent and immense natural resources, which would be developed by the canal. This region will open up a large trade with American ports, and contribute a considerable revenue to the canal; its climate is much more favourable than that of the Panama region to the members of the Caucasian race, and it could readily be colonised by the Americans. In more detail, Mr. Davis calculates the cost per ton per annum for Nicaragua as 33 cents against 13 cents for Panama, while of the eight typical routes likely to avail themselves of an Isthmian canal, he calculates that seven would save by the use of the Panama route, the saving varying from 1 to 43 cents per ton. On the whole, however, Mr. Davis seems to incline to the belief that the possibilities of the development of the Nicaragua region counterbalance the advantages enjoyed by the Panama route.—*Bulletin of the American Geographical Society*, xxxiv.

Since the writing of Dr. Davis's paper the United States Senate has passed a Bill authorising the purchase of the capital stock, concession, unfinished work and machinery, and other property of the Panama Canal Company, the completion of the canal, and the acquisition from the Republic of Colombia of a strip of land six miles wide along the route. In the event of the Panama Company being unable to give a satisfactory title, or Colombia refusing to sell the land, the Nicaragua route is to be adopted. On the other hand, the House of Representatives has passed a resolution in favour of the Nicaragua route; but it is believed that the decision of the Senate in favour of Panama will now be accepted.—*Nature.*

Opening of Hanoi Bridge.—On the 28th of March the great bridge of Hanoi (Tonkin) was opened, as was also the railway from Hanoi to Haiphong. The bridge has taken three and a half years to complete, the first stone being laid on September 28, 1898. It crosses the Red river, and is 1682 metres long. The total outlay has been 6,200,000 francs, and while French industry has furnished the materials and directed the work, the actual construction has been carried out by the natives.—*Revue Française.*

NEW BOOKS.

EUROPE.

Denmark, Past and Present. By Margaret Thomas. London: Anthony Treberne and Co., Ltd., 1902. *Price* 6*s.*

The writer of this book has formed a very just idea of its value and capabilities when in the last chapter she says to her readers, "Put it on your shelf

beside your Murrays and your Baedekers." It is in fact a guidebook written on somewhat different lines from Murray and Baedeker, but nevertheless a guidebook pure and simple. Regarded in this light it may be commended. The writer waxes enthusiastic as often as possible in her descriptions of a land where apparently there is no scenery, and where "the fundamental characteristics of the people are irresolution, phlegm, confidence, and sameness," qualities all very well in their way, but not calculated to induce the average tourist to desert Switzerland and the Tyrol for Copenhagen and its vicinity.

Mediæval London. By William Benham, D.D., F.S.A., and Charles Welch, F.S.A. London: Seeley and Co., Limited. New York: The Macmillan Company, 1901. *Price 5s.*

The November issue of the Portfolio is by the capable pens of Dr. Benham, Canon of Canterbury, and Mr. Welch, the Librarian to the Corporation of London, and is of unusual interest and merit. It deals with mediæval London, *i.e.* London from the days of King Alfred down to the Great Fire of 1666, and contains much amusing and interesting information regarding the appearance of London and its conditions of life during that period. It is embellished with many exceptionally good illustrations, the most important of which are copies of the principal parts of a pen-drawing of London from Westminster to Greenwich by the Flemish artist Van den Wyngaerde about the year 1560, and selections from the drawings of John Wykeham Archer between the years 1841 and 1850. The originals of the former, now in the Bodleian Library, Oxford, are supposed to have been made for King Philip of Spain; the originals of the latter were made to the order of Mr. Twopenny, and are now in the British Museum.

Guide to Capri. By Harold E. Trower. Second Edition. *Presented by the Author.*

Set in the blue waters of the Bay of Naples, Capri, like a fine gem of concentrated beauty, presents new charms to every eye and in every light. Its rare natural beauties, together with its romantic historical associations, combine to make it an attraction to all tourists, as well as a charming retreat for artists, poets, philosophers, and lotus eaters. This little guide, cleverly written by the genial British consul, Mr. Trower, should prove most useful to the passing traveller, as well as to the prospective resident.

Our Neighbours' Series. London: G. Newnes, 1901. *Each volume price 3s. 6d., and well illustrated.*

1. *French Life in Town and Country.* By Hannah Lynch. Pp. 261.

A most interesting volume by one who knows France well. She is particularly successful in describing her personal experiences of French convent life, and concludes that "Nuns are the worst teachers in the world and the least conscientious." Her criticism of the French Academy is amusing, but her references to "the mild André Theuriet and the dull Paul Bourget," whilst Anatole France is hailed "the living master of French literature," are uncalled for. She contrasts French frugality with Irish extravagance, and says that "the great, the abiding charm of the French middle class is the absence of vulgar pretension." She declares that Frenchwomen have been grossly aspersed by French novelists, and maintains that, as a rule, women play a most honourable and useful *rôle* in France. Her statement that "peasant proprietorship works admirably in France" is scarcely borne out by the great migration taking place from the provinces to the towns.

Proceeding from a Roman Catholic, the book contains rare and valuable testimony to the excellence of the government of M. Waldeck-Rousseau.

2. *German Life in Town and Country.* By W. H. Dawson. Pp. 271.

"The Germany of to-day is essentially a land of shrewd-headed, practical-minded, deft-handed men and women who are determined that, in the race for material wealth, their country shall never be found far behind." Mr. Dawson says this Materialism has entirely changed the character of many German towns. The old titular spirit is, however, as rampant as ever, and he amusingly satirises the manner in which the title of every official must be mentioned in addressing him or his wife during conversation. After most ably reviewing the condition of the German working man, the author next describes rural life and labour, and mentions that between 1871 and 1895 the rural population had decreased by nearly a million. He considers that the enforced military service confers great physical and moral advantages, and depicts slouching rural labourers being converted into smart soldiers. "Now they march; before they waddled." German Rationalism is afterwards discussed, and we are told that it is "found in its crassest forms" among the urban working classes, Socialism being their true religion. The author descants on the "unpardonable rudeness and thoughtlessness" which he thinks often distinguish the English abroad, but says nothing of the equally unpardonable thoughtlessness which has lately often distinguished German public references to Britain.

3. *Swiss Life in Town and Country.* By A. T. Story. Pp. 248.

The "Playground of Europe" will, says the author, one day become "the Mecca of all students and admirers of pure and unadulterated democratic government." Even the primary schools are attended by the children of rich and poor alike. Everybody works in Switzerland, which is a perfect hive of industry, and nowhere have working men learned so well the lesson of organisation. The author gives able chapters on Swiss festivals and on the literature and the press of Switzerland.

A Popular History of the Ancient Britons or the Welsh People, from the Earliest Times to the End of the Nineteenth Century. By the Rev. John Evans, B.A. London: Elliot Stock, 1901. Pp. ix + 413. *Price* 10*s.* 6*d.*

In this closely printed volume, a succinct, not to say bald, account of the Welsh people is laid before the public. In the earlier pages, when treating of the prehistoric inhabitants and the arrival of the Celts in Britain, the author is unfortunately not sufficiently equipped for the task he has undertaken. He places implicit confidence in such a broken reed as *Words and Places* by the late Canon Taylor, and pictures to his readers the Aryans marching out of Asia in successive detachments with the Celts, who left "marks" of their passage *en route*, in the van of the migration, as the latest result of modern inquiry. He entirely ignores, perhaps never heard of, the newer hypothesis that the home of the Aryan-speaking peoples is to be looked for in Europe; and he has not grasped the fact that the "marks," by which he means the Celtic place-names in eastern Europe, are the result of a comparatively late easterly movement of the Gauls from the west. He tries to make his readers believe that all the languages of the world belong to three stocks, Turanian, Semitic, and Aryan, and that possibly all these may, in course of time, be proved to have a common origin. His philology is equally behind the age, for he tells us that the original forms of Eboracum and

Glevum were Evrauc and Gloui, instead of *vice versâ*, and that Londinium contains the element "dun," a fort. In other parts of the volume historical facts are given correctly and dispassionately enough, but in a very dry way, and to make matters worse, the author's English prose leaves much to desire, for he does not handle the language as if it were his native tongue.

Highways and Byways in Hertfordshire. By H. W. Tompkins. With Illustrations by F. L. Griggs, and a Map. Pp. 348. *Price* 6*s.*

Hertfordshire is one of the least known of English counties, and it does not deserve this neglect. We are all familiar with Lord Salisbury's house at Hatfield and with the Abbey of St. Albans, but with most of us the county town is the only other name we can recall. Indeed, it is not a region of populous towns—rather of small villages, of fields and dales, and through these Mr. Tompkins on foot guides us most pleasantly. He has information on all subjects—literature and agriculture, bird-life and geology, architecture and local worthies. It is, however, on the literary side that he has most to say. He brings before us in their proper localities a long list of writers associated with the county, from Sir John Mandeville and Dame Juliana Berners to Mrs. Humphrey Ward; above all, Charles Lamb, in large measure the *genius loci*. Mr. Tompkins says little of the scenery of the county, no doubt leaving this designedly to the pencil of his artist colleague. The illustrations by the latter are numerous, and many, specially those of architectural subjects, are distinctly successful. Others may best be described as "Oo, a' oo."

The Path to Rome. By H. Belloc. London: George Allen, 1902. *Price* 7*s.* 6*d.*

It is difficult to imagine the object of the writer of this book. It purports to be the record of an attempt to walk in a more or less straight line from Toul, in the valley of the Upper Mozelle, to Rome, in which the writer failed, as of course he was bound to do. It is heavily padded with digressions on all sorts of subjects, the matter and the style of which are equally wearisome, pretentious, and meagre.

Ward, Lock and Co.'s Illustrated Guide Books. London: Ward, Lock and Co., Ltd. *Price* 1*s. each.*

Aberdeen, Deeside, Balmoral, etc. 3 Maps and 40 Illustrations.
Oban and Western Highlands. 7 Maps and 50 Illustrations.
Inverness, Speyside, etc. 4 Maps and 50 Illustrations.

Messrs. Ward and Lock's cheap series of Guides have achieved a considerable popularity, and these new editions show a marked improvement in respect of numerous attractive illustrations and some new maps, although some antiquated specimens of cartography are still allowed to remain.

Pearson's Gossipy Guides. London: C. Arthur Pearson, Ltd. *Price* 1*s. each.*

Edinburgh and District. 80 Illustrations and 6 Maps and Plans.
London and District. 108 Illustrations and 19 Maps and Plans.
South Devon. 80 Illustrations and 6 Maps.
Great Yarmouth, etc. 80 Illustrations and 5 Maps.
Ilfracombe and North Devon. 80 Illustrations and 5 Maps.
Paris and Environs. 100 Illustrations and 2 Plans.

This new series of Guides appears to be designed to meet the requirements of

the sight-seeing tourist. They are brightly written, profusely illustrated with excellent reproductions of photographs, and some good maps and plans.

London and Environs. By Karl Baedeker. Thirteenth Revised Edition. Leipsic: K. Baedeker, 1902. Pp. 459. *Price* 6 *marks.*

Compared with previous issues this is a very superior edition, and when we mention that it contains nearly 100 pages more than the Fifth Edition (1885), and that every page bears evidence of thought and care, its progress and value can be estimated. The particularly new plans in the Thirteenth Edition are those of The Tower, the Wallace Gallery, Westminster Abbey, Windsor Castle, and Kew Gardens. An excellent topographic map of the Environs of London is given, but we should desiderate orographic and geological maps as well. Some of the best London hotels have no asterisk of commendation, whilst some very expensive ones are recommended.

The Naturalist on the Thames. By C. J. Cornish, F.Z.S. London: Seeley and Co., 1902. Pp. 260. *Price* 7*s.* 6*d.*

Everything in this charming book will satisfy the naturalist, the lover of the country, and the devotee of sport. Although nominally confined to the Thames valley, it relates to the habits of many British animals, and discusses general questions such as the migration and protection of wild birds. With regard to the latter, the author states that "among the happiest results of the modern feeling about birds is the conversion of the whole of the Thames above the tideway into a 'protected area.'" Shooting on the river having been put a stop to, the water-fowl began to return, kingfishers to increase, and all birds to become tamer. There are remarkable illustrations from photographs of some of the shyest of animals, such as otters, badgers, foxes, and wild ducks. Altogether Mr. Cornish has provided a treat for the lover of nature, and contributed an excellent book of popular science. A map of the Thames Valley would have made references intelligible, and an index ought to have been appended, for the multifarious contents of the volume range from "Butterfly sleep" to the discovery of the bones of great stags and elephants in digging the foundations of the new South Kensington Museum, being "the beasts which used to graze on the Kensington *veldt* or on the flats by the riverside."

ASIA.

Gazetteer of the Bombay Presidency, vol. ix., parts i. and ii. Bombay, 1901.

This instalment apparently completes the *Government Gazetteer of the Bombay Presidency*, the numerous volumes of which have been published simply in the order in which they have been got ready. The first to appear was volume ii., for the districts of Surat and Broach, in August 1877; volume xxvi., which deals with Bombay itself—the island capital of the Presidency, with its great trading and commercial interests, vast population, and varied history, appeared in three parts in 1893-94; whilst volume i., in two parts, was issued in 1896. The whole work is nominally in twenty-six volumes, but for several districts they are divided into two or three parts, and the whole is bound in thirty-four substantial volumes, to which a general index volume has to be added.

This work was planned in 1868 upon a very modest scale, to be completed in perhaps two or three volumes, for a total expenditure of Rs. 12,000, including the payment to the editor, who was expected to do the work outside his official employment. This was set about and materials collected, including thirty-one articles on British districts and native states; but in 1872 the manuscript was

stolen from the office and sold as waste-paper in Punā bazaar. Prepared in a somewhat hurried fashion, and partly from books and old reports, this loss was perhaps not very serious; it prepared the way at least for a much more exhaustive and valuable work. Sir James Peile, the Director of Public Instruction, then sought the services of a new editor, but the old terms did not tempt the gentleman he consulted. After nearly a year's delay the whole scheme was changed: Mr. James Macnabb Campbell of the Civil Service—son of the late Rev. Dr. John Macleod Campbell of Row—was appointed compiler, to attend solely to the work and with an adequate office staff. Mr. Campbell was allowed a free hand and could command all information; collectors were made district compilers and prepared the statistical information for the different districts; the office staff and other contributors supplemented these accounts and gave shape to each volume, and time and expenditure were undefined.

Under such circumstances it was hardly to be expected that the volumes should be all of equal merit: thus the earlier volumes on Surat and Broach, Ahmedabad, etc., are less detailed than most of the later volumes, and to supplement their defects the two divisions of volume ix. have been issued, whilst the first part of volume i. supplies the history of the same districts. On the other hand, in some of the later volumes there may appear to some to be an almost unnecessary amount of detail; thus in the volume on Khandesh, some 96 pages are devoted to the Ajanta Buddhist Caves, which are not in British territory at all, but in the Nizam's dominions; and of this section, pages 497 to 574 have been taken from a monograph by Dr. Burgess, apparently without acknowledgment. In turn the compiler of the *Nizam's Aurangabad Gazetteer* has reproduced the same account from the Khandesh volume. Sindh is not included in the series of volumes: why we are not informed.

As a whole, the work is a most important and valuable one, and will compare favourably with Sir W. W. Hunter's *Statistical Account of Bengal*. Its completion reflects much credit on the industry and judgment of the compiler; and it is pleasant to note that his services have been acknowledged by a Government resolution of 11th August 1884, by the order of knighthood, and by the further thanks of the Bombay Government on the completion of the work. The maps are altogether unworthy of the work, and ought to be superseded by an atlas in good cartography, with maps to a scale of at least an inch to 10 miles.

Auf Java und Sumatra. Streifzüge und Forschungsreisen im Lande der Malaien. Von Dr. K. Giesenhagen, a.o. Professor der Botanik an der Universität München. Leipzig: Druck und Verlag von B. G. Teubner, 1902. Pp. 270. *Price M.* 9.

Dr. Giesenhagen made a tour in 1898 and 1899, at the expense of the German Government, to study the flora of Java and Sumatra, to learn the methods of cultivation of tropical crops, and especially to bring home seeds and seedlings of plants that might be suitable for cultivation in the German colonies. His scientific work is barely touched on in these pages. A few subjects, as the cultivation of rice, coffee, etc., are treated at some length, but, on the whole, the book is simply a description of his journey and of the country as seen by an intelligent tourist. The author landed at Batavia, spent a considerable time at Buitenzorg, working at the Botanical Gardens, travelled through Western Java to Soerakarta, crossed Sumatra from Peladju to Benkoelen, and sailed round the northern extremity of the island, making an excursion to the highlands of Padang, and touching at Atjeh (Achin) and Medan. Though he followed well-beaten routes, Dr. Giesenhagen's narrative is interesting as describing countries not often visited by

Europeans, except Dutch officials and others whose business takes them there, and some of his information is only to be found elsewhere in Dutch publications. The views are beautiful and interesting; especially to be noticed are the view of the ruined temples of Prambanan and the photographs of the sculptures.

The Real Siberia. By JOHN FOSTER FRAZER. London, Paris, New York, and Melbourne: Cassell and Company, Limited, 1902. *Price* 6*s.*

This volume has no pretension to be one of original exploration or research. It is merely a pleasantly written account of a journey from Moscow to Vladivostok, not by the well-known Siberian express, but by the ordinary daily train. Apparently the author had never read any of the many recent works on Siberia, and expected to find himself in a land of horrors and misery. He was of course soon undeceived. Like all English travellers, he was welcomed everywhere, and promptly shown everything he wanted to see. He soon found that the life of a Siberian convict is far from being a miserable one, and that Siberia itself promises to become the granary of Europe and is one of the richest territories in the Eastern hemisphere. All this of course is well known. The most useful part of the book is where the author corroborates the warnings of other authors, that Siberia is practically neglected by English merchants, and that Germany and the United States are vying with each other in exploiting the country. The work is illustrated with some good photographs.

Siam in the Twentieth Century: being the Experiences and Impressions of a British Official. By J. D. G. CAMPBELL, one of His Majesty's Inspectors of Schools, and recently Educational Adviser to the Siamese Government. London: Edward Arnold, Publisher to the India Office, 1902. Pp. xii + 332.

Mr. Campbell explains in his preface and introduction that having been lent by the English Board of Education for two years from October 1899 as Educational Adviser to the Government of Siam, he gathered during his stay in that country such information as he could, and carefully noted his impressions for subsequent publication in England. His experiences, therefore, did not extend over a very long period, and were perhaps not very varied; and little time has been spent in pondering over the impressions made by them on his mind. In the book which he has written the predominant facts and features of Siamese geography and history, sociology and religion, natural products and commerce, are broadly outlined, and the author's views regarding them and their possible and probable bearings upon the future of Siam and the Siamese are set forth often with a good deal of prolixity. As there is no lack of recent books and learned papers descriptive of the country and people, so there is nothing very novel in the author's views. These will be found familiar in a general sense by all who, having lived or become interested in the Asiatic tropics, have studied the history, religions, and character of their peoples, and speculated on the results of the impact upon them of the intruder from western temperate lands, with his lust of territory and commercial gain, and his aggressive civilisation. But the book is on the whole well fitted to convey "to the general reader at home and the future visitor to Siam" some conception of the past and present condition of this interesting little Oriental kingdom, which, although situated between the upper and nether millstones of French Indo-China and British India (Burma), has so far escaped being crushed. The author, moreover, has at command an admirably clear and fluent style, so that his book may easily and pleasurably be read.

Limits of space prevent a lengthier notice of what may be called the scientific aspects of the book. But it may not be out of place to draw attention to the

political situation as between Siam and France. Our author gives a sensible and temperate account of this in his eleventh chapter. It is a situation in which the British Government has a serious concern, and in which there is need of a steady and vigilant policy on the part of the British Foreign Office and the Government of India. That this is not now wanting may perhaps be assumed from the recent reappointment, after a prolonged vacancy, of a British Minister to the Court of Bangkok, as a counterweight to the diplomatic representation of France, backed as it is, even in that out of the way capital, by that of Russia.

The commercial situation also is not without special interest. The trade, seaborne and inland, between Siam and the French possessions is comparatively very small, and at present tends to decline—a curious enough comment upon the political attitude of the French colonial party towards Siam. In so far as Europe is directly concerned, a considerable part of the export and import trade is with Great Britain, followed at some interval by Germany. With France it is practically nil. But Siam deals chiefly with Singapore and Hong Kong, cosmopolitan ports; and the carrying trade between them and Siam has for the last two or three years been for the most part in German hands, through the purchase from British companies of their steamers plying from these ports. There are, however, indications that efforts will be made to contest the German monopoly, which already has been found by shippers of other nationalities to work injuriously for all interests other than German.

Sul Limitare dell' India. Par Dott. Alfonso Lomonaco. Casa Edetrice Nazionale. Torino-Roma: Roux e Viarengo, 1902.

In this volume we have from the experienced hands of Dr. Lomonaco an account of a journey in 1897 from Naples to Bombay and of his observations in the second city of the British Empire. Nothing very remarkable occurred on the journey or in Bombay, but even to those who have often done the journey and who know Bombay well there is a force and intensity in the descriptions which will recall many strange and some uncomfortable memories of days gone by. Starting from Naples early in September, the learned Doctor reached the Red Sea at the hottest time of the year, and his description of his experience of the heat there, and of what Indian travellers know well as "prickly heat," leaves nothing to be desired. Zola at his best is not more realistic. Any attempt to translate his description of sea-sickness and the wonderful cure which he discovered for it would merely demonstrate the feebleness of the English language, so we must content ourselves with suggesting to our readers that they should look for it themselves in Chapter ii. At Bombay he lost no time in seeing everything that was to be seen, and he was of course profoundly impressed by the density of the population and the admixture of races. His descriptions of the buildings and scenery in Bombay are vivid and luminous, and will, we trust, induce many of his fellow-countrymen to follow his good example and pay a visit to our Indian Empire undeterred by sea-sickness or "prickly heat."

AFRICA.

A Ride in Morocco. By Frances Macnab. London: Edward Arnold, 1902. *Price* 15*s.*

The lady who writes this book landed at Tangiers on the first evening of the century, and the ride which she describes was along the north-western coast of Morocco from Tangier to Saffi. In the course of the ride, when she had reached Mazagan, she made an expedition southwards to the town of Morocco itself. The

narrative indicates that she is possessed of more than the necessary qualifications of a good traveller in uncanny parts, for even with the prestige which everywhere attaches to being a British subject, she ran very grave risks in travelling among what are well known to be the most turbulent and fanatic of Mohammedan tribes. Her sex enabled her to see much of a phase of Morocco which is closed to the ordinary traveller, and she made the best use of her opportunities. Her descriptions of the scenery and people are bright and graphic, and she seems to have become a general favourite wherever she went, even although at some places she acquired the reputation of a magician. Her observations lead to the conclusion that Morocco as an empire is doomed to collapse and to pass under the dominion of France, which will thereby acquire an enormous increase of power and influence on the Mediterranean. The book has a few illustrations and a useful map.

The Foundation of British East Africa. By J. W. Gregory, D.Sc. London Horace Marshall and Son, 1901. Pp. x+271. *Price* 6*s.*

The attention of the Empire for more than two years has been turned to Southern Africa, where a racial war has now happily come to an end ; and owing to our thoughts having been absorbed in it, we are in danger of giving but little consideration to our other possessions in the Dark Continent. Thus a book like the one now before us is welcome, as recalling to us that we have in the east of Africa possessions, not so vast in extent, but possibly quite as valuable as those in the south. It treats the subject of British East Africa at much greater length and in a different way from General Sir F. D. Lugard in his *Story of Uganda* which we noticed in April of last year. After a clear and interesting description of the geography and ethnology of East Africa, the writer sets forth in succinct but graphic language what has been ascertained of the history of expeditions to the coast and interior in ancient times by the Phœnicians, Arabs, and Portuguese, and then devotes some most interesting chapters to the work of the early pioneers of civilisation — Krapp, Rebmann, Burton, Speke, Grant, Baker, Stanley, Fischer, Thomson, Teliki, and others. The historical part of the book ends with a description of how Lugard saved Uganda and the suppression of the Soudanese mutiny. The book concludes with an account of Uganda under the Foreign Office and an estimate, by no means too rosy, of its future prospects. Continuity of civil administration, in place of repeated changes of civil officers, and peace among the rival missionary agencies seem to be imperative if British East Africa is to have a fair chance of recovery from its present depression. The former can be secured from the Foreign Office, but the latter is a much more formidable undertaking. The book has some good illustrations and a useful map.

The Gold of Ophir, whence brought and by whom? By Professor A. H. Keane, F.R.G.S. London : Ed. Stanford, 1901. Pp. xv+244. *Price* 5*s.*

Professor Keane has no doubt at all that Ophir was not the original source of the gold King David and Solomon imported from the south in the palmy days of the Kingdom of Israel. Ophir was only the *emporium*, situated on the southern coast of Arabia, which has been identified with the Mocha or Portus Nobilis of the Greeks and Romans, and it was from *Havilah* that the "Gold of Ophir" was originally derived. Every three years the ships of Solomon and Hiram, King of Tyre, made a cruise down the Red Sea from Ezion-geber, a port at the head of the Gulf of Akaba, which at that time lay within the dominions of the wise king. The fleets returned from Ophir laden with gold, precious stones, frankincense, and myrrh, and the voyages of the little ships of 3000 years ago must have been feats

of great maritime skill and endurance. The Queen of Sheba, whose kingdom was Yemen, the Arabia Felix of the ancients, came by land and not by sea in her famous visit to the Court of Solomon, and she also brought among other treasures gold and precious stones from Ophir, the commercial port of her Sabæan state in southern Arabia. This part of Arabia was inhabited by the Himyarite branch of the Semitic family, the northern division being the home of the Ishmaelites, or Arabs proper. The Himyarites, whose empire has long ago disappeared, left behind them multitudes of palaces, temples, and other buildings, with thousands of rock inscriptions whose character is not to be mistaken. As Arabia is not an auriferous country, the "Gold of Ophir" must have been imported, and the author has little doubt that it was brought from *Rhodesia*, which he identifies with the Havilah of Scripture. The recent discoveries in Rhodesia show that gold was mined on a vast scale by the ancients, and the ancient ruins associated with the mines have a strong resemblance to the Himyarite monuments of Arabia. The workings in Rhodesia (or Havilah) were, according to the author, first opened by the Himyarites from South Arabia, who were followed in Solomon's time by the Jews and Phœnicians, all of whom reached their destination by way of Madagascar. The treasures of Havilah found an outlet on the coast at Tharshish, which was probably situated near the present Sofala, and the mines were worked by slave-labour under conditions that make one shudder to think of.

This small but solid contribution to the "Ophir" controversy is full of interest, and the author has given a series of very substantial reasons for the extremely important conclusions at which he has arrived.

Mediæval Towns Series. Cairo. By Stanley Lane-Poole, Professor of Arabic, T.C.D. London: J. M. Dent and Co., 1902. Pp. 340. *Price* 4*s.* 6*d.*

The present little volume offers in a very condensed form the result of Professor Lane-Poole's researches as contained in his well-known works on Egypt, Cairo, and Saracen art. In a preface he mentions several leading modern authorities on Cairo, but omits reference to Mr. Basil Worsfold's able exposition of the art displayed in its mosques. He evidently, however, does not agree with Mr. Worsfold that British rule has led to the "redemption of Egypt," for he oddly maintains that the inhabitants of Cairo consider that the justice, fixed taxes, sanitation, and pure water introduced by the British have not improved their city, which, he says, "has been desperately dull since they came in." He extols the good old days, when there was "plenty of blood and assassination," and fancies that the Cairenes were far happier then—which is absurd. The volume narrates "the story of Cairo" with fulness and skill, and is illustrated with sketches showing the mediæval city, and a map of Cairo at the present day.

AMERICA.

History of the Conquest of Peru. By W. H. Prescott. Edited by John Forster Kirk. London: Bell and Sons, 1902. 2 vols.

We need only call attention to this excellent little reprint of Prescott's classical work, which is published in Bohn's Classical Library.

Central and South America. Vol. II. By A. H. Keane, F.R.G.S. Edited by Sir Clements Markham, K.C.B., F.R.S., President of the Royal Geographical and Hakluyt Societies. New Issue. London: Edward Stanford, 1901. Pp. xxiv + 495. *Price* 15*s.*

This second volume on *Central and South America* is from the capable pen of Mr. A. H. Keane, F.R.G.S., and is second to none of its predecessors in

"Stanford's Compendium of Geography and Travel" Series in erudition and literary merit. It deals with Mexico, the Isthmian republics, the West Indies, and the Guianas, and embodies "the more important results of the numerous scientific expeditions made to almost every part of South America during the last three decades by Whymper, Conway, Fitzgerald, Crevaux, Thouar, im Thurn, Rodway, Ehrenreich, von der Steinen, Reiss, Church, Stübel, Ball, Brigham, Hill, Romero, Thompson, Seler, M'Gee, Moreno, Mercer, Stoll, Uhle, and many other distinguished geographers, archæologists, naturalists, and anthropologists." Those who know Mr. Keane's *Asia* and *Africa* and *Man Past and Present* will be prepared to find this work a model of patient condensation and profound erudition, while at the same time it is enlivened by a clear and graphic style and wealth of illustration. The numerous maps and illustrations to the work also merit a word of commendation.

Central and South America with the West Indies: Descriptive Geography from Original Sources. By F. D. and A. J. Herbertson. 239 pages, with Illustrations. *Price* 2*s.*

The scheme of this series has been admirably carried forward in the latest volume. The introduction furnishes an up-to-date statement of the geography from all points of view of the portion of the globe reviewed, while the body of the book contains extracts of great interest to all who wish to form a mental picture of these countries. Most readers at this time will turn to the account of Martinique and St. Pierre, taken from Hasting Jay's *Glimpses of the Tropics.* St. Vincent is not described, nor are many other well-known places, as for instance Bahia, or the port of Santos which has now almost taken its place, for the book is not exhaustive. But references to other descriptions are given in footnotes and in a bibliography appended. The volume is well printed, and whether for teachers, students, or general readers, is one to be recommended.

AUSTRALASIA.

Savage Island. By Basil Thomson, Governor of Dartmoor. London: John Murray, 1900. *Price* 7*s.* 6*d.*

In this volume we have a very interesting account of a trip to Niuë or Savage Island and to Tonga, which may be considered the most distant places in the British Empire. Savage Island is 1000 miles NNE. of New Zealand, and received its name from the reception the inhabitants gave to Captain Cook in 1774. In 1900 the author was deputed to take the two islands under British protection in terms of the Samoa Treaty of 1899 with Germany. Fortunately it was not his first visit to them, so he did not appear as a stranger, a fact which materially facilitated the somewhat delicate operation of instituting the Protectorate. The narrative is brightened with many pleasant and interesting digressions, setting forth what is known of the previous history of the islands, their peculiar customs and habits, their religion, and their present condition and prospects, and there are some good photographs of the chief dignitaries.

GENERAL.

The British Empire Series. Vol. v.—*General.* London: Kegan Paul, Trench, Trübner and Co., Ltd., 1902.

This volume is the last of the "British Empire" Series, and, after a glowing introduction by Lord Avebury, more familiarly known to us all as Sir John

Lubbock, deals with St. Helena and the European insular possessions of Great Britain, after which we have a series of articles on subjects connected with the Empire, such as the Army, the Navy, the Railway and Telegraph Systems, Mercantile Marine and Trade. The concluding chapters on Sport, Mohammedanism, Christian Missions, Duties of Empire, and Imperial Federation, differ greatly from the majority of their predecessors in being distinctly controversial and in the inadequacy of their treatment. For example, the chapter on "Duties of Empire" is merely an attack on the British administration of India, such as we are accustomed and amused to hear from Mr. Digby or Mr. Hyndman when addressing a socialist meeting. No authorities are referred to later than the year 1883, *i.e.* nearly twenty years ago, and the description given by the writer of the treatment of natives by Europeans, if intended for the present day, is ludicrously incorrect. The general tone and accuracy of the article may be gathered from its conclusion, that "what we are entitled to say is simply this, that nowhere does the British Empire appear to be raising lower races collectively in the scale of civilisation"; an assertion which, possibly to some extent true half a century ago, is certainly not true now. The present condition of the fellaheen of Egypt, the Indians of Canada, the Malayans of the Straits Settlement, the Haussas of West Africa, etc., is a complete refutation of such a charge. Even with regard to India we find in Lord Avebury's introduction the testimony of the well-known American economist, Mr. Wells, to the effect that "there is no Government in the world whose administration is more honestly conducted, and which is doing more for the material good of the governed than the present English Government in India." And of our general administration elsewhere he says: "Wherever sovereignty of England has gone, two blades of grass have grown where one grew before. Her flag, wherever it has been advanced, has benefited the country over which it floats, and has carried with it civilisation, the Christian religion, order, justice, and prosperity." The French Foreign Secretary, Barthélemy de St. Hilaire, corroborates this evidence, in comparison with which the ignorant crudities of the writer of the chapter on Duties of Empire are of no value.

The Student's Handbook of Stratigraphical Geology. By A. J. Jukes-Browne. London: Stanford, 1902.

This volume is virtually a second edition of the *Student's Handbook of Historical Geology*, but it has been entirely rewritten and brought up to date. Among the new features of the present edition are the expansion of the chapters dealing with Palæozoic rocks, an expansion rendered necessary by the increase of knowledge since the publication of the last edition, and the insertion of numerous small geological maps of interesting areas in England and Wales. These should be very valuable to students, especially if the latter take the author's advice and colour them for themselves. The insertion of numerous figures of fossils taken from Ramsay's *Physical Geography and Geology of Britain* we cannot regard as an improvement, as these figures have been so frequently repeated as to be already perfectly familiar to students. We think also that a list of at least the geological maps contained in the volume would have been an aid to those using the volume. In other respects the volume is greatly improved; it is admirably illustrated even apart from Ramsay's figures, and the style is more interesting than in the former edition, which in some respects suggested mental pemmican. The addition of numerous bibliographical references in itself greatly enhances the value of the present volume.

Statesman's Year-Book. Edited by J. Scott Keltie. London : Macmillan, 1902.

This useful compilation has this year been enlarged, revised, and brought thoroughly up to date. Among the new matter added are included the results of the census taken last spring in the British Islands, in India, and in most of the possessions of the British Crown ; an account of the development of education in Britain, including the reconstruction of London University and the inauguration of the new University at Birmingham ; accounts of the increase of the navy and the reorganisation of the army, while the space devoted to the Colonies has been increased by the fuller accounts given of certain of the minor dependencies. Among the maps and diagrams there are certain showing the results of recent censuses at home and abroad.

L'Année Coloniale. Publiée sous la direction de MM. Ch. Mourey, Chargé du service de la statistique à l'Office colonial, et Louis Brunel. Première Année (1899), Deuxième Année (1900). Pp. 413 et 442. Paris : Librairie Illustrée Montgrédien et Cie. *Price* 10 *francs.*

The idea of this annual is to summarise the political and economic record of each of the French colonies for the past year. The work will no doubt rank as a valuable reference book, yet it is also an eminently readable volume. Each colony is dealt with separately, and the sketch of its year's progress is illustrated with statistical tables, maps, and pictures. The annual for 1900 is divided into three sections. The first section contains articles by specialists dealing with general questions such as education, public health, etc. ; the second gives the year's history of each colony ; the third is a bibliography of all published books and articles relating to each colony.

In the High Heavens. By Sir Robert S. Ball, D.Sc., LL.D., F.R.S. London : Isbister and Co., 1901. Pp. vi + 383. *Price* 5*s.*

We have received a copy of this interesting little volume, but feel constrained to point out that while the title-page bears the date 1901, without any statement to the effect that the volume is a new edition or a reprint, the preface is dated 1893.

BOOKS RECEIVED.

We have received the following new books, which will be reviewed in due course :—

The Royal Road-book of Ireland. With 200 Colour Plans. By H. R. G. Inglis. Edinburgh : Gall and Inglis, 1902. Small 8vo. Pp. 144. *Price* 1*s.*

The Holy City, Athens, and Egypt. By Sir William T. Charley. London : Marshall Brothers, 1902. 8vo. Pp. xiv + 446. *Price* 10*s.* 6*d.*

Pearson's Gossipy Guides. London : Pearson, 1902. *Price* 1*s. each.*

Great Yarmouth, Lowestoft, and Cromer. Pp. 198.

Ilfracombe and District. Pp. 150.

South Devon. Pp. 173.

London and District. Pp. 247.

Paris and Environs. Pp. 246.

Edinburgh and District. Pp. 129.

Chilean-Argentine Boundary Arbitration. Chilean Statement. 4 vols. an Appendix 2 vols. With Map. London, 1902.

Deux Ans chez Les Anthropophages. Par Raymond Colrat de Montrozier. Paris: Plon, 1902. Pp. x + 326. *Price* 4 *fr.*

A Guide to Zermatt and the Matterhorn. By Edward Whymper. London: Murray, 6th edition, 1902. Pp. xiv + 224. Crown 8vo. *Price* 3*s.*

A Guide to Chamounix and Mont Blanc. By Edward Whymper. London: Murray, 7th edition, 1902. Pp. xiv + 206. Crown 8vo. *Price* 3*s.*

Norwegisches Lesebuch. By J. C. Poestion. Wien, Pest, Leipzig: Hartleben, no date. Pp. viii + 184. 8vo. *Price* 2 *marks.*

London and its Environs. By Karl Baedeker. Leipsic: Karl Baedeker, 1902. With 4 Maps and 24 Plans. 13th edition. *Price* 6*s.*

India and its Problems. By W. S. Lilly. London: Sands and Co., 1902. Pp. xx + 324. Demy 8vo. *Price* 7*s.* 6*d.*

La Haute-Savoie, Guide du Touriste, du Naturaliste, et d'Archéologue par Marc le Roux. Paris: Masson et Cie, 1902. 8vo. Pp. 337. *Price* 4 *fr.* 50.

The Statistical Year-Book of Canada for 1901. Issued by the Department of Agriculture, Ottawa. Government Printing Office, 1902.

Publishers forwarding books for review will greatly oblige by marking the **price** *in clear figures, especially in the case of foreign books.*

NEW MAPS.

EUROPE.

ORDNANCE SURVEY OF SCOTLAND. Scale 4 miles to 1 inch. Sheets 1, 2, 4, 5, 6. Reduced from the One-inch Map. Revised in 1895, and published by Col. D. A. Johnstone, R.E., 1902. *Price* 1*s. each.*

Ordnance Survey Office, Southampton.

We have received these farther sheets of the new quarter-inch map already noticed in our June issue.

ORDNANCE SURVEY OF SCOTLAND.—The following publications were issued from 1st to 31st May 1902:—Parish Maps (1 : 2500 Scale, Revised, with Houses ruled, and with areas, Price 3*s.* each). *Aberdeenshire.*—Sheets III. (16 and 12); IV. 8, 12, 16; VII. 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16; VIII. 1, 3, 4, 5, 6, 7, 9; IX. 9; XI. 1, 2, 3, 4; XII. 1, 3; XIII. 4; LXX. 15; LXXXI. 3, 4, 8, 11, 12. *Banffshire.*—Sheet XXXVI. 9. *Forfarshire.*—Sheets XXIV. 15, 16; XXXI. 2, 6, 8, 10; XXXVII. 6, 10, 14. *Inverness-shire.*—Sheets XXXIV. (15 and 16); XXXV. 10, 13, 14; XLI. 15, 16; XLII. 13; LIV. 4, 7, 8, 11; LV. 1. *Orkney*—Sheets LXXXIX. 16; XC. 15; XCIV. 2, 3, 4, 7, 8; XCV. 1, 2.

Note.—There is no coloured edition of these Sheets, and the unrevised impressions are withdrawn from sale.

Six-Inch Maps (Quarter Sheets—Revised). *Aberdeenshire*—101 SE. (Price 1*s.*). *Forfarshire.*—(1 SW. and 1 SE.) (Price 1*s.*). *Perthshire.*—33 SE. (Price 1*s.*). With Contours:—*Aberdeenshire.*—12 SW., 12 SE.; 19 NE. (Price 1*s.* each). *Perthshire.*—54 SW.; 74 SW.; 98 SW.; 99 SE. (Price 1*s.* each).

The Zincographs of the undernamed Ordnance Survey Plans having, in many cases, been sold out, reprints have been prepared, and are now ready for sale. All plans hitherto published in Sections are filled in complete to their margins or to the County Boundary. *Ross-shire* (1 : 2500 Scale).—Sheet LV. 7. With areas added; but the old edition will be sold out.

General Remarks :—*Ross-shire*—Nigg and Fearn (1 : 2500 Scale).—Sheet LV. 7. With areas added ; coloured price now altered to 3s. These prices are for coloured copies ; uncoloured are 3s. each with areas, and 2s. 6d. each without areas.

Catalogue of the Ordnance Survey Publications of Scotland, revised and corrected to the 1st January 1902. This edition is for 6-inch and larger scale maps only.

Scotland.—One-Inch Map, New Series (Revised, with hills, printed in colour). *Barra.* Sheet 58. *Gighay.*—Sheet 59. *South Uist.*—Sheet 69 (Price 1s. 6d. each).

One-Inch Parish Indexes.—Printed in colours in two forms, one showing the 1 : 2500 Scale Maps and the other the six-inch Sheets. Sheet 128 (Price 1s. 6d.).

Four-Mile Maps (by Sheets, fully Coloured).—Sheets 1, 2, 3, 4, 5, 6 (Price 1s. each).

County Diagrams.—Scale four miles to one inch, showing civil parishes with a table of their areas and the numbers of their one-inch Indexes. (Perthshire and Clackmannanshire) ; Zetland (Price 6d. each).

The following publications were issued from 1st to 30th June 1902 :—Parish Maps (1 : 2500 Scale, Revised, with Houses ruled, and with areas, Price 3s. each). *Aberdeenshire.*—Sheets III. 13, 14 ; V. 5, 6, 7, 9, 10, 12, 13 ; VII. 1 ; LI. 14. *Forfarshire.*—Sheets XXIV. 12 ; XXXI. 3, 4, 7, 11, 12, 14, 15 ; XXXII. 9, 13 ; XXXVII. 2, 3, 4, 7, 8 ; XLII. 4. *Inverness-shire.*—Sheet LIV. 3. *Orkney.*—Sheets XCIV. (14 and 13) ; XCV. 4, 6, 8, 12, 14 ; XCVI. 1, 6.

Note.—There is no coloured edition of these Sheets, and the unrevised impressions are withdrawn from sale.

Six-Inch Maps (Quarter Sheets—Revised). *Forfarshire.*—2 SE.; 5 SW.; 9 SW.; 10 NW.; 12 NW.; 13 NW.; 23 SW. (Price 1s. each). With Contours : —*Aberdeenshire.*—11 SW.; 13 SW.; 28 NW.; 33 SW., 33 SE.; 34 SW.; 42 NE.; 42 SE.; 51 NE.; 52 SW.; 62 NW.; 71 SW.; 75 NE., 75 SW.; 85 NE. (Price 1s. each). *Forfarshire.*—49 NW. (Price 1s.). *Perthshire.*—43 NW. (Price 1s.).

Six-inch County Maps (Revised). Engraved. *Aberdeenshire.*—Sheet 49 (Price 2s.).

Scotland.—Four-mile Maps by Counties (hill shaded, printed in colours and folded in covers. *The Orkney Islands.*—Sheet 3 (Price 1s.).

SCOTLAND—ADMIRALTY CHART. Hebrides, Eigneig More to Black Leversay. No. 3168 (174). April 1902. *Price* 2*s.* 6*d.* *Admiralty Office, London.*

This new chart of the east coast of the Western Isles is an important addition to our Scottish series.

ENGLAND AND WALES. Cyclists' General Touring Map. Coloured to show height of land and principal roads. Scale 13 miles to an inch. *Price* 1*s.* *John Bartholomew and Co., Edinburgh.*

BIRMINGHAM DISTRICT. Bartholomew's Cyclists' Road Map. Scale half an inch to a mile. *Mounted on cloth, price* 1*s.* 6*d. net.* *John Bartholomew and Co., Edinburgh.*

IRELAND. The Royal Road Book. With 200 contour plans by Harry R. G. Inglis. *Price* 1*s. net.* *Gall and Inglis, Edinburgh and London.*

This is a companion volume to Mr. Inglis's well-known "Contour Road Book of Scotland." It bears evidence of much painstaking work which ought to be appreciated by cyclists.

AFRICA.

BRITISH CENTRAL AFRICA. War Office Map of Africa. Scale 1 : 250,000, or about four miles to an inch. 1902. *District Sheets*—Sena, Dedza Boma, Mlangeni, Mwera, South Nyasa, Chiromo, Kirk Mountains, Fort Manning, Blantyre. Reproduced from a map supplied by the Chief Surveyor, British Central Africa. *Price* 1*s.* 6*d. each.*

This is the first instalment for Nyasaland of the new large scale War Office map. It is marked as a provisional issue, but as a basis for mapping the explorations of travellers it will be of great value. In the compilation of such a map it seems extraordinary that the Admiralty Surveys of Lake Nyasa should not be fully incorporated.

NIGERIA. War Office Map of Africa. Scale 1 : 1,000,000, or about sixteen miles to an inch. 1902. *District Sheets*—Central Nigeria, Yola. *Price* 2*s. each.* *Intelligence Division War Office.*

These are two new sheets of this important map. As yet no portion of this country has been accurately surveyed, and these maps rather reveal the extreme scantiness of our knowledge of these vast territories of our empire.

NORTH-WEST SOMALILAND. War Office Map of Africa. Scale 1 : 1,000,000, or about sixteen miles to an inch. 1902. *Price* 2*s.*
Intelligence Division War Office.

The publication of the War Office sheets of Somaliland gives us the first authoritative map of this country. Although no portion of the country included in this sheet has yet been surveyed, yet, considering the prevailing barren character of the country, it is very well mapped.

NEW ATLASES.

ATLAS UNIVERSEL DE GÉOGRAPHIE. Commencé par M. Vivien de Saint-Martin et continué par Fr. Schrader. No. 18. Espagne et Portugal en 4 feuilles—Feuille Nord-est. *Librairie Hachette et Cie., Paris.*

The publication of this great Atlas is making very slow progress. The first part was issued in 1877, the fourth part was noticed in the first number of our Magazine, seventeen years ago, and still there are many maps to come. The Atlas in the elaborate finish of its detail is a splendid piece of work, but its chances of success as a publication must be seriously affected if it is not completed within a reasonable time.

STIELER'S HAND-ATLAS. Neue neunte Lieferungs Ausgabe von ——, 100 Karten in Kupferstich. 7. Lieferung : Nr. 60 Arabien, Nr. 63 Vorder Indien. *Price* 60 *Pfennig.* *Justus Perthes, Gotha.*

ATLAS FOR SOUTH AFRICAN SCHOOLS. A new series of Physical and Political Maps. Fifth and enlarged edition. 1902. By J. G. Bartholomew. *Price* 1*s.* 6*d.* *T. Nelson and Sons, London, Edinburgh, and New York.*

This new edition, issued with the declaration of peace, shows the new British Colonies with corrections to date. The physical maps are unique in showing a general summary of recent geographical research in South Africa.

THE SCOTTISH GEOGRAPHICAL MAGAZINE.

LAKE BONNEVILLE—THE PREDECESSOR OF THE GREAT SALT LAKE.

By Professor James E. Talmage, Ph.D., F.R.S.E., Etc.

In a former issue of this *Magazine* (December 1901) space was allowed an article entitled "The Great Salt Lake." Emphasis was therein given to the well-known truth that the Great Salt Lake of to-day is a diminutive representative of an inland sea which once occupied a considerable part of the Great Basin area in its eastern section. It has been suggested that a general description of the ancient lake would be acceptable, as a supplement to the first paper. It is, then, to Lake Bonneville—the Pleistocene predecessor of the Great Salt Lake—to which attention is now invited.

True, the greater lake, as such, is no longer a geographical feature; only Salt Lake, two smaller lakes, one fresh and the other saline, and a few insignificant playas exist to-day as standing water-bodies within the Bonneville area. Nevertheless, prominent shore-lines, terraces both carved and built, wave-sculpture, sea-caves, spits, bars, deltas, in fact most if not all of the ordinary lacustrine relics appear; and these unite in detailing the history of the lake of bygone days to which they owe their existence.

Utah presents the remains, fairly complete, of an extensive fossil lake. As to the extent and other general features of the early water-body there is little need of theory; the facts are too plainly disclosed, and it has been justly said that few existing lakes have been more accurately charted than has Lake Bonneville.

The earlier observations concerning the origin of Salt Lake and Lake Bonneville were made and recorded as incidental to investigation of the Great Basin region: though many items of record antedate the recog-

nition of the Basin area as a unit of structure. A consideration of the Great Basin is essentially associated with any study of Lake Bonneville.

The Great Basin.

The Great Basin is a region of closed drainage, the largest of its kind in North America. Its extent is estimated as equal to eight times that of all other closed basins within the United States; yet, as to size, its rank is low in comparison with the closed drainage areas of other continents.

The Great Basin presents an extreme length of 880 miles, extending east of south and west of north, and a greatest width of 572 miles from east to west. The region so embraced is of roughly triangular outline, enclosing about 210,000 square miles, and comprising the eastern half of Utah, the greater part of Nevada, and extensive areas in eastern California, south-eastern Oregon, south-eastern Idaho, and south-western Wyoming. The southern limits have not been defined with accuracy owing to the incompleteness of the survey work in those parts.

It has been estimated by Gilbert that the total area of other interior or closed basins of the United States is about 25,000 square miles, making a total of land within closed basin boundaries equal to about one-thirteenth of the entire surface of the country. North of the Basin the drainage is that of the Columbia River, and therefore tributary to the Pacific; on the east is a region drained by the Colorado River (also Pacific), and on the west the drainage is evidently Pacific. North-east of the Basin the drainage is to the Atlantic.

While the Basin is "great" in comparison with other North American units of interior drainage, it is small in extent when contrasted with the closed basins of other continents. Murray's compilation of data ascribes to Australia 52 per cent. of its area as regions of closed drainage; to Africa, 31 per cent.; to Eurasia, 28 per cent.; to South America, 7·2 per cent.; and to North America, 3·2 per cent.[1]

The Great Basin is by no means a typical occurrence of the kind suggested by its name. It is no single depression with hilly or mountainous rim and low interior; indeed its surface topography as it appears to the traveller is characteristically mountainous from edge to edge, embracing numerous valley-cups between the ranges, some of which depressions are occupied by lakes. The region is nevertheless a unit as gauged by the standard of main water-partings, since it possesses no outlet of superficial drainage, but, on the contrary, suffers removal of water from its surface by evaporation alone.

The Basin as a whole comprises numerous secondary areas of closed drainage, each minor depression being characterised by lake, playa, or desert sink. Approximately, a hundred of these secondary and smaller basins are recognisable. A central ridge of broad extent differentiates the eastern and western sections of the Basin region. This important fact was first clearly demonstrated by the geologists of the Fortieth

[1] Paper by John Murray, "The Total Annual Rainfall of the Lands of the Globe," etc., this *Magazine*, vol. iii. pp. 65-77. See also *Monographs of the United States Geological Survey*, vol. i. *Lake Bonneville*, by Grove Karl Gilbert, Washington, 1890, p. 12.

Parallel Exploration. The results are thus concisely summarised by the author of *Lake Bonneville*:—

"The work of this corps covered a belt one hundred miles broad, spanning the Great Basin in its broadest part, and within this belt the Pleistocene lakes were studied, and for the first time approximately mapped. It was shown that the corrugated surface of the Great Basin in this latitude is higher in the middle than at the east and west margins, warranting general subdivision into the Utah basin, the Nevada plateau, and the Nevada basin; that the Utah basin formerly contained a large lake, Bonneville, extending both north and south beyond the belt of survey; that the Nevada basin contained a similar lake. Lahontan, likewise exceeding the limits of the belt; and that the valleys of the central plateau held within the belt no less than eight small Pleistocene lakes."[1]

In the Basin country, hilly and mountainous topography prevails from the Wasatch range westward to the Sierras. A glance at a good geographical map of the region reveals the dominant feature of numerous short mountain ranges, of moderate height, and with a strikingly uniform north and south trend. These are the Basin ranges, of peculiar structure, walled in by the more massive and imposing Wasatch range in Utah, and by the Sierra Nevada in California.

The Basin mountains reveal little of the crumpled and folded strata characterising the typical mountain range; they are devoid of great anticlinal arches, or synclinal troughs, such features occurring only on a small scale as local phenomena.

The structure of the Basin ranges is that of the block mountain mass, or, more accurately, of the faulted monocline. Each range may be regarded as a fractured crust-block, lifted on one side so as to present a comparatively steep face, or escarpment, and sloping away from the crest parallel to the tilted strata. The type-form is greatly modified by local erosion. But the characteristic structure is so well shown that similar occurrences elsewhere are generally described as of the "Basin Range Type."

Such faulted mountains are directly the result of stretching and tension, and are distinctively uplifts of pre-existing land masses; while the typical range, deposited on marginal sea-bottoms, and folded as the result of lateral pressure, has been described as being "born of the sea."

Concerning the origin of the Basin ranges, and of the second birth or later elevation of the Wasatch and the Sierra Nevada, which may be regarded as forming the eastern and western walls of the Basin, Le Conte has written: "The Sierra received its present form and altitude by the upheaving on its eastern side of a great mountain block—300 miles long and 50 to 70 miles wide, forming there a normal fault, with a displacement of not less than 15,000 feet. . . . On the other boundary of the Basin region the Wasatch was at the same time also heaved up on its western side, forming there one of the greatest faults known" [40,000

[1] *Lake Bonneville*, by G. K. Gilbert, vol. i.; *Monographs of the United States Geological Survey*, p. 17. For citations, see *Geological Exploration of the Fortieth Parallel*, vols. i. and ii. Washington, 1877, 1878.

feet according to King]. . . . "The whole Basin region, including the Sierra on one side and the Wasatch on the other, was lifted, probably by intumescent lavas, into an arch, and by tension split into great oblong crust-blocks. The arch broke down, the crust-blocks readjusted themselves to form the Basin ranges, and left the abutments, viz., the Sierra and the Wasatch, with their raw faces looking towards one another across the intervening Basin. It must not be imagined, however, that this took place at once as a great cataclysm, but rather that it took place very slowly—the lifting, the breaking down, and the readjustment all going on at the same time."[1]

Where the local drainage of the secondary basins, walled by the monoclinal ranges of faulted crust-blocks, exceeds the loss by evaporation, lakes appear; where the evaporation predominates during dry seasons and is superseded by precipitation at other times, playa-lakes abound.

Most of the Bonneville lakes are alkaline or salt, though a few fresh-water bodies of small dimensions exist. Among these latter are Utah Lake, the overflow from which is conveyed by the Jordan River to Great Salt Lake, in Utah; Bear Lake, cut by the Utah-Idaho line, discharging through Bear River into Great Salt Lake; and Lake Tahoe, the "gem of the Sierras," which finds an outlet through Truckee canyon into Pyramid and Winnemucca lakes, 2400 feet below. Among the salt and alkaline lakes of the Great Basin are Great Salt Lake and Sevier Lake, in Utah; Soda, Walker, Winnemucca, and Pyramid lakes, in Nevada; Albert Lake, in Oregon; Mono Lake and Owen's Lake, California.

The history of exploration and discovery within the Great Basin constitutes the foundation upon which rests our present knowledge of Lake Bonneville. An authentic summary of investigations in the Basin region has been given by Grove Karl Gilbert as a fitting preface to his masterly Monograph on the ancient Bonneville Lake.[2]

The earlier explorations of the Basin territory were purely geographical. As far back as 1776 the Basin was entered from the south-east by Padre Escalante,[3] but the travels of this intrepid explorer were far too limited to afford him even an intimation of the drainage peculiarities. Observations made by white traders with the Indian tribes are preserved in traditions originating during the first quarter of the nineteenth century. These pointed to the existence of lakes without outlet in the northern part of the Basin region, but they afforded little in the way of detailed or reliable description. In 1833 Captain Benjamin L. E. Bonneville crossed the Basin rim, recorded his observations and inferences, and furthermore prepared a map giving evidence of interior drainage.[4]

Ten years later Captain John C. Fremont prosecuted his valuable

[1] *Elements of Geology*, 4th edition, p. 277. See also *American Journal of Science*, vol. xxxviii. p. 262, for an article by the same author.

[2] *Lake Bonneville*, before cited, pp. 12-19.

[3] See this *Magazine*, December 1901, pp. 617, 618.

[4] See mention in this *Magazine*, December 1901, page 618.

labours, and demonstrated the closed drainage features of the region. In addition, he noted the evidence afforded by driftage above the level of the Great Salt Lake as indicating a somewhat higher level during earlier times, but he made no record of the grander phenomena of still more ancient shore lines at higher levels.[1]

But it is Stansbury, who in 1849-50 explored the Great Salt Lake under Government auspices, to whom we owe the beginning of our definite knowledge concerning the ancestor of the Great Salt Lake—the Pleistocene water-body to which, in recognition of merit in an earlier explorer, Gilbert has given the enduring name, Lake Bonneville. Stansbury first grasped the thought of an ancient inland sea in the valleys of Utah. Referring to a particular plain near Lakeside, on the Southern Pacific Railway line, he wrote:—

"This extensive flat appears to have formed, at one time, the northern portion of the lake, for it is now but slightly above its present level. Upon the slope of a ridge connected with this plain, thirteen distinct successive beaches, or water-marks, were counted, which had evidently at one time been washed by the lake, and must have been the result of its action, continued for some time, at each level. The highest of these is now about two hundred feet above the valley, which has itself been left by the lake, owing probably to gradual elevation occasioned by subterraneous causes. If this supposition be correct, and all appearances conspire to support it, there must have been here at some former period a vast inland sea, extending for hundreds of miles; and the isolated mountains which now tower above the flats, forming its western and south-western shores, were doubtless huge islands similar to those which now rise from the diminished waters of the lake."[2]

In 1851 William P. Blake added to our knowledge of the Great Basin in general by demonstrating the arid conditions and the consequent disappearance of the lakes in the western portion of the region. Apparently he did not recognise the significance of humid conditions as productive of the lacustrine flood.[3]

In 1854 Lieutenant E. G. Beckwith visited portions of the Great Basin, in charge of a Government expedition organised for geographical exploration. He recognised the significance of the old beach lines, and correctly inferred the prior existence of a water-body far exceeding the dimensions of the Great Salt Lake. In his official report he says: "The old shore lines existing in the vicinity of the Great Salt Lake present an interesting study. Some of them are elevated but a few feet (from five to twenty) above the present level of the lake, and are as distinct and as well defined and preserved as its present beaches. . . .

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[1] See *Report of the Exploring Expedition to the Rocky Mountains in the year* 1842, *and to Oregon and North California in the years* 1843-1844, by Brevet-Captain J. C. Fremont. Washington, 1845.

[2] *Exploration and Survey of the Valley of the Great Salt Lake*, etc., by Howard Stansbury, Captain Topographical Engineers, Philadelphia, 1852. p. 105. Quoted by Gilbert in *Lake Bonneville*, before cited, p. 13.

[3] *Geological Report*, by William P. Blake. See *Pacific Railway Reports*, vol. v. pp. 97-99, 236-239.

In the Tuilla [Tooele] valley, at the south end of the lake, they are so remarkably distinct and peculiar in form and position that one of them, on which we travelled in crossing that valley on the 7th of May, attracted the observation of the least-informed teamsters of our party—to whom it appeared artificial. Its elevation we judged to be twenty feet above the present level of the lake. . . . The recessions of the waters of the lake from the beaches at these comparatively slight elevations, took place, beyond all doubt, within a very modern geological period; and the volume of the water of the lake at each subsidence, by whatever cause produced, and whether by gradual or spasmodic action, seems as plainly to have been diminished; for its present volume is not sufficient

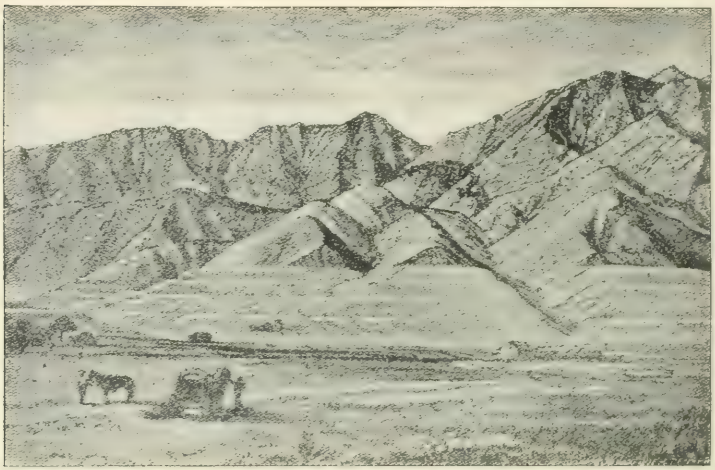

FIG. 1.—Shore Lines of Lake Bonneville. South end of Oquirrh Mountains. After Sketch by Holmes.—(U.S.G.S. *Monograph I.*)

to form a lake of even two or three feet in depth over the area indicated by these shores, and, if existing, would be annually dried up during the summer. . . . But high above these diminutive banks of recent date, on the mountains to the east, south, and west, and on the islands of the Great Salt Lake, formations are seen, preserving apparently a uniform elevation as far as the eye can extend—formations on a magnificent scale, which, hastily examined, seem no less unmistakably than the former to indicate their shore origin."[1]

The record of observed phenomena was augmented by the contributions of Simpson, and his associate, Henry Engelmann, official geologist,[2]

[1] *Explorations*, etc., Lieut. E. G. Beckwith. *Pacific Railroad Reports*, Washington, 1855, vol. ii., footnote to p. 97. Quoted in *Lake Bonneville*, before cited, pp. 14, 15.

[2] *Explorations across the Great Basin of the Territory of Utah for a direct wagon route from Camp Floyd to Genoa, in Carson Valley, in* 1859, by Captain J. H. Simpson. Washington, 1876.

by Whitney,[1] Hayden,[2] Bradley,[3] Poole,[4] and Peale,[5] as also Howell[6] and Gilbert.

Latest, best, and most comprehensive of all is the record made by Grove Karl Gilbert, of whose classic work the present writer presumes to present but an imperfect synopsis. Dr. Gilbert was engaged under government appointment from 1875 to 1878 in the work connected with Lake Bonneville, and his monograph is the standard authority on our present subject.[7]

In connection with the work of Dr. Gilbert, that of Professor I. C. Russel is to be considered.[8] Russel studied and demonstrated the characteristics of Lake Lahontan, a sister-lake to Bonneville, which occupied the western depression of the Basin. While the separation of the two lake areas is distinct, and while the water-bodies are to be regarded as independent occurrences, each is the complement of the other, and the history of both is involved in any study of Great Basin phenomena. As to age, and, in general, as to stage of progression from a large fresh-water body to a series of saline lakes of diminished proportions, Lahontan is the counterpart of Bonneville; and the differences are those dependent on the purely local features of relative supply and loss, and in the chemical composition of the dissolved solids.

Lake Bonneville—General Features.

Former Extent.—The existing topographic evidence is abundant and conclusive that this ancient lake, when at its greatest volume, extended eastward to the Wasatch mountains and to the plateau ridge which forms an extension of the mountain-highland beyond the southern termination of the range; westward over the Great American Desert into Nevada; southward nearly to the Arizona line embracing Sevier and Escalante deserts; and northward to the upper limits of Cache Valley, 25 miles beyond the Utah-Idaho boundary. At its highest level Lake Bonneville presented an extreme length north and south of 300 miles, a breadth east and west of 180 miles, and an area of nearly 20,000 square miles. It lay between the parallels 42° 30′ and 37° 30′ North Latitude, and was bisected almost equally by the meridian of 113° West Longitude. In superficial area, Lake Bonneville was nearly equal to Lake Huron.

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[1] *Geological Survey of California*, vol. i., Philadelphia, 1865, pp. 451, 452.

[2] *United States Geological Survey of Wyoming*, etc., 1870, by F. V. Hayden. Washington, 1872.

[3] *United States Geological Survey of the Territories*, Report by Frank H. Bradley. Washington, 1873.

[4] *The Great American Desert*, by Henry S. Poole. *Proceedings Nova Scotia Institution, National Science*, vol. iii. pp. 208-220. Cited by Gilbert in *Lake Bonneville*, p. 16.

[5] *United States Geological Survey of the Territories for* 1877, Report of A. C. Peale. Washington, 1879.

[6] See *Explorations and Surveys West of the* 100*th Meridian*. Washington, 1875. Part III., by Edwin C. Howell.

[7] Vol. i., *Monographs of the United States Geological Survey. Lake Bonneville*, by Grove Karl Gilbert. Washington, 1890.

[8] *Monographs of the United States Geological Survey*, vol. xi., by I. C. Russel. *Geological History of Lake Lahontan*. Washington, 1885.

Of the pristine lake the principal divisions were: (1) the main body, covering the area of the existing Salt Lake and its sloping shore eastward to the Wasatch, as also part of the Great American Desert. (2) Cache Bay, covering the present Cache Valley in Utah and Idaho. (3) Utah Bay, occupying the valley of the present Utah Lake in the east-central part. (4) Sevier Bay, and (5) Escalante Bay, both to the south. The names are identical with the present geographical designations. The topographical elevations of the Bonneville area once existing as islands and archipelagoes, now appear as hills and mountain spurs, with valley passes in place of the old-time straits. On the Great Desert the hills are half-buried in lake sediments, and rise from the lake floor

FIG. 2.—View on desert, west of Great Salt Lake, showing mountains partly buried by Lake Bonneville sediments. After Gilbert.—(U.S.G.S. *Monograph I.*)

as sharply as do the present islands from the water-level of the Salt Lake. Locally these half-hidden mountains are known as islands to-day. (See Fig. 2.)

Existing Remnants.—The Great Salt Lake, greatly exceeding in magnitude the combined area of all other remnants of the ancient water-body, has been specially described.[1]

Utah Lake is a fresh-water body, 27 miles in length by 12 in breadth, with an area of 127 square miles. It drains northward through the Jordan River into Great Salt Lake. It receives its supply from the Provo, American Fork, and Spanish Fork rivers, and from smaller streams locally called creeks. During the irrigation season most of the water-supply is diverted at higher levels, and the lake level is lower.

Sevier Lake occupies a depressed area in Millard County, with waters intensely saline. It is virtually a playa of variable dimensions,

[1] See this *Magazine*, December 1901, pp. 617-644.

FIG. 3.—Flood plain of the modern stream, Logan River, a valley of erosion in the delta formed at the Provo level in Lake Bonneville.

attaining in more humid seasons an extent of from 180 to 200 square miles, while during periods of drought it practically dries away, leaving a crystalline deposit of sodium chloride and sulphate several inches in depth, to mark its site.

Shore Lines.—The mountain-sides, against which the ancient waters beat, reveal the successive levels by shore lines and littoral terraces, in places so distinct, that even the wayfarer, unskilled in deciphering field phenomena, describes them as old water margins. In some sections, terraces of deposition declare the former boundaries; elsewhere, wave-cut cliffs, sea-caves, and ripple marks, as plain as those now forming on the lake shore, define the outline.

There is a succession of shore lines extending from the present lake

Fig. 4.—Bonneville and Intermediate Embankments near Wellsville, Utah. The figure shows the contrast between littoral and sub-aërial topography. After Gilbert.—(U.S.G.S. *Monograph I.*)

level to an altitude fully a thousand feet higher; these may be thus classified in descending order:—

(1) The Bonneville shore line, the highest, and in places the most striking to ordinary observation, appears, as stated, at a height of about a thousand feet above the present mean lake level. Its conspicuous appearance is due more to the contrast between subaqueous and sub-aërial carving and cutting, than to the distinctness of littoral shaping at this level. By the strict standard of accurate measurement, it is weaker than the Provo shore line below, but much of its boldness has doubtless been lost through subsequent erosion.

(2) The Provo shore line, 375 feet below the Bonneville, was named by Howell[1] to emphasise the great size and importance of the delta

[1] *Geological Survey West of the 100th Meridian*, vol. iii.; see p. 250 for Edwin E. Howell's description of the great delta near Provo city.

occurring at this level at the mouth of Provo Canyon, where the Provo River enters Utah Valley. (See Fig. 3.) Gauged by the extent of the deltas and terraces at the several elevations, this level is by far the most imposing of all. Let it not be forgotten, however, that with the lowering of the base level of the inflowing streams through the recession of the lake, the Bonneville deltas have been largely demolished, and their material removed by the agents that had built them.

(3) The Intermediate shore lines occur as a series between the Bonneville and the Provo levels. These show a number of fluctuations, no one of them marking a level of sufficient duration to produce sea-caves, cliffs, or terraces comparable with those that occur either above or below.

(4) At an altitude somewhat greater than 300 feet above the present lake surface, and therefore practically midway between the Provo level and the lake of to-day, a fourth shore line is plainly visible at certain localities. It is most distinctly defined on Stansbury Island, one of the largest land masses rising from the waters of the present lake, and in consequence it has been named the Stansbury shore line.

The superposition of lake sediments on deltas and terraces at certain levels, and the absence of such from others, clearly indicate the following sequence as the chronological order of the several shore levels:—

1. Intermediate.
2. Bonneville.
3. Provo.
4. Stansbury.

The Bonneville Outlet.

The existence of distinctive shore lines clearly prove the duration of successive lake levels, each sufficient to engrave an enduring record at the respective elevation. Such shore phenomena could result only from the lake having stood at a constant level, or from its having returned at frequent intervals to the same height. Evidently the first assumption is the more reasonable, and its acceptance presupposes the existence of an outlet, through which the surplus waters could have escaped. Long prior to the actual discovery of an outlet the existence of such an escape channel was predicted. Gilbert announced (1) that the Bonneville shore line would be found to have been due to an overflow of the lake; and (2) that the Provo line would be traceable to a similar determining cause.[1] Writing later, in 1890, he says: "The first of these predictions has been verified in its letter but not in its spirit; the second has proved to have full warrant. My anticipation was based on the following consideration: A lake without overflow has its extent determined by the relation of precipitation to evaporation within its basin; and since this ratio is inconstant, fluctuating from year to year, and from decade to decade, it is highly improbable that the water

[1] *Exploration West of the 100th Meridian*, vol. iii. p. 90.

level will remain constant long enough to permit its waves to carve a deep record. I failed to take account of the fact that the highest shore-mark of the series is conspicuous by reason of the contrast there exhibited between land sculpture and littoral sculpture. We know that the height of the Bonneville shore line was determined in a certain sense by overflow, since a discharge limited the rise of the water, but the carving of the shore was essentially completed before the discharge, and as soon as that began the water fell. At the Provo horizon, on the contrary, a constant or nearly constant water level was maintained by discharge for a long time."[1]

With unwavering confidence as to its existence the Bonneville outlet was sought. Pass after pass was examined and measured, but though some of these notches in the basin rim were but a few feet above the high-water mark, they were successively discarded as impossible for outlets, for, aside from their elevation, none showed any evidence of a river passage outward from the lake. At last a notch of adequate size and at the proper elevation was discovered in the northern part of Cache Valley, at Red Rock Pass, near Oxford, Idaho; moreover, it bore unmistakable testimony to the former passage of a large river, the channel of which was easily traceable through Marsh Valley, and on through Portneuf Pass to the Snake River. The continuation of the course of the outflowing Bonneville waters was plain—onward to the Columbia and thence to the Pacific. During the epoch of fall from the Bonneville to the Provo level, the lake was no part of a closed basin; it sent its contribution to the earth's greatest ocean.

The shore formation in the vicinity of the outlet consisted of loose and practically uncemented alluvium, underlaid by compact limestone. As the alluvial barrier was cut away at the point of passage, the lake rapidly drained to the Provo level, resulting in a fall of 375 feet. At the lower level the sill of resistant limestone was encountered, and the river, which had been of great dimensions, assumed the normal proportions of an overflow stream regulating the level of the diminished lake. Then, after a long period, during which the littoral phenomena at the Provo level were produced, the recession of the lake was resumed, this time as a result of climatic change toward aridity, and the fall has virtually continued until the present time.

No outlet has been found for any of the levels of the Intermediate series of shore lines; indeed, in view of the chronological order of the several levels it is evident that no Intermediate escape channel could have existed, unless we postulate the subsequent elevation of the rim above the Bonneville height; and for such there is no warrant.

The channel through which the old lake discharged is to-day unmistakably plain, even to the casual observer. The Oregon Short Line Railway has utilised the notch in the basin rim and the slope of the Bonneville River for its road-bed.

The dimensions of the old channel and the corrosion phenomena conclusively show that Bonneville River must have been of great

[1] *Lake Bonneville*, p. 171.

volume, and, as to flow, a veritable torrent. It has been compared with Niagara River as a similar stream. Concerning the probable duration of the river at its maximum volume, that is, concerning the time necessary for the lowering of the lake to the Provo level, the author of *Lake Bonneville* has written: "How long the discharging river maintained its colossal dimensions cannot be learned, but the period certainly was not great. The entire prism of water between the Bonneville and Provo planes would be discharged by the Niagara channel in less than twenty-five years; and if the Bonneville River reached a greater size, it could have maintained it only for a shorter time."[1]

FIG. 5.—Terrace gashed transversely by later erosion, Traverse Mountains, Utah. Provo level of Lake Bonneville.

SHORE DEPOSITS.

As local conditions have determined, the old lake shores have been cut by waves, or have been covered by deposits resulting from stream and littoral current action. Terraces, alluvial cones, and deltas attest the efficiency of these agents in both destructive and constructive phenomena.

Alluvial cones of many degrees of slope, the flatter kinds distinctively known as fans, appear at the mouths of ravines debouching upon the plains. Of these deposits many were evidently constructed prior to the

[1] *Lake Bonneville*, p. 177.

Bonneville epoch ; while others, by the absence of shore lines and lake sediments, show that they date from a period later than that of the lake record proper. In Salt Lake Valley and elsewhere, the cones and fans, issuing from the numerous canyons and ravines at short intervals, completely coalesce and present the appearance of continuous terraces. These have been generally gashed by later streams, and in consequence display admirable illustrations of dissected terraces. (See Fig. 5.) Between the true fan or cone, deposited by torrential streams heavily laden with detritus, most of which was pushed along rather than carried in suspension, and which was left as the stream velocity suffered a sudden check, and the delta on the other hand,—the deposit of streams nearing their base level and gently stopped by their entrance into a body of standing water,—there are all gradations within the area under consideration. The gradation appears in the passage from the heterogeneous and purely unsorted deposits of the cone through partly differentiated and roughly bedded accumulations, to the orderly delta beds.

Deltas built in the ancient lake were first pointed out by Bradley in 1872,[1] but little attention was given to the subject prior to the efficient labours of Howell[2] and Gilbert.[3] While in places remnants of delta deposits at the highest or Bonneville level are well preserved, the largest of the existing deltas belong to the Provo stage. The streams following the receding lake destroyed much of their own delta construction at higher levels and earlier periods. In rare instances, however, the record of delta-building at Intermediate, Bonneville, and Provo levels is complete. Following the American Fork River from its canyon gateway to its present mouth in Utah Lake, the observer may read the history of delta formation and destruction with comparative ease. As revealed by the stream-made section, the Bonneville delta in this locality shows a thickness of 120 feet at its outer margin, and a radius of over 48,000 feet. The Intermediate delta, being first formed, was partly covered by the higher and later Bonneville ; both were cut through by the rejuvenated stream, whose base level was lowered as the lake fell to the Provo horizon, and the material so removed was built into a still younger delta.

The deltas of the Logan River in Cache Valley form a series of sloping terraces extending downward from the mountain face. Each delta indicates the partial destruction of earlier depositions above. In Salt Lake Valley, the delta formed by City Creek (an important water-supply for Salt Lake City to-day) reveals itself by high beaches through which the stream has kept for itself a passage in its efforts to follow the shrinking lake. (See Fig. 7.) The delta blends at its apical end with the abundant alluvial deposits laid down in the canyon itself. Wave and current action appears to have been unusually strong in this locality, and the typical form of the delta is considerably modified. The

[1] *Geological Survey of the Territories*, Annual Report for 1872, Frank H. Bradley, p. 192.

[2] *Geological Survey West of the 100th Meridian*, vol. iii. p. 250 : Edwin E. Howell.

[3] *Lake Bonneville*, p. 143.

delta constructed by the Provo River in Utah Valley covers over 20,000 acres, and another delta appears a few miles to the south—the work of the Spanish Fork stream—with an area of 8000 acres.

The delta lands are in many parts of the basin the choicest of all for garden, farm, and residence properties. The most desirable residence portions of Salt Lake City, Ogden, Logan, and many smaller towns are on the delta surface and slopes; and the rich farming and fruit-raising

FIG. 6.—Part of the great Logan Delta, east of Logan City, Utah.

sections of the counties along the Wasatch base are largely delta deposits.

SHORE LINE DEFORMATION.

While the several shore lines have been spoken of as levels, striking differences of altitude for the same line have been demonstrated. For example, the decisive results of Gilbert's work have proved extensive deformations, which have been charted for both the Bonneville and the Provo shores. The level of the Great Salt Lake was taken as a datum plane, but as this surface is variable its approximate mean was arbitrarily established as the zero of a scale established at the lake shore, known as the Lake Shore Gauge. I take from the published data the following items by way of illustration, with the possible limit of error at each point of observation. The altitudes are expressed in feet above the zero of the Lake Shore Gauge.[1]

[1] *Lake Bonneville*, pp. 365, 366.

Locality.	Observed Height. Feet.	Probable Error. Feet.
Meadow Creek Canyon, Escalante Desert	1256	35
Antelope Spring ,, ,,	1008	30
North end of Aqui Range	1070	3
Promontory, 10 miles south of station, S.P.R.R.	1050	3
Stockton, head of Tooele Valley	1014	5
Willard, east shore of Great Salt Lake	985	3
Fort Douglas, near Salt Lake City	980	5
Red Rock Pass, north end of Cache Valley	906	4
Santaquin, south of Utah Lake	902	3

As to the explanation of such deformation, the first cause suggesting itself as probable is that of local faulting, of which phenomenon there are many striking illustrations within the Bonneville area. But examination demonstrates such faulting to be a wholly insufficient if at all a true cause of the observed deformation. The regions of faulting do not correspond with the areas of greatest change in shore line altitude, nor is the change in height always in the direction of local movement as shown by the fault throw. Crustal movements on a more extended scale than that involved in local faults—epeirogenic rather than orogenic disturbances alone—are generally accepted as the most probable explanation. As to the ultimate cause or causes producing these movements of great superficial extent within the basin of the old lake, many possible theories have been suggested, but their detailed consideration is scarcely within the scope of the present paper.

But, though the faults occurring within the region are not to be regarded as the prime cause of the shore line deformation, the faults themselves are of such general interest as to warrant passing mention.

The grander of these faults are those associated with the great mountain ranges, the escarpments of which constitute the steeper face of the ranges; and of these the profound Wasatch fault stands first both with respect to throw and to linear extent. The abrupt western face of this majestic range is a great fault scarp, which in many parts has not yet lost its raw appearance of recent fracture. The throw of this great dislocation is placed at 40,000 feet.[1]

While the Wasatch, viewed as a whole, belongs to the anticlinal type of mountain ranges, its western portion presents the structure of the faulted monocline. The true monoclinal tilt is shown in the first members of the Basin Range series west of the valleys immediately overlooked by the Wasatch, and of these the Oquirrh, Aqui, and House ranges are good examples. In each of these the throw is to the west. But these great faults occurred at a period antedating the Bonneville day, and are in no essential connected with the lacustrine occurrences of the Basin.

Beside the great faults connected with mountain ranges, numerous secondary disturbances are shown by scarps along the foothills and in

[1] *Survey of the 40th Parallel*, vol. i. pp. 728-746: King.

the alluvial deposits of the valleys. These scarps are small but well defined; and are generally not only post-Bonneville as to age but of so recent origin as to be properly classed with current phenomena. Some of the secondary faults are compound, that is, they present the appearance each of a depressed block with two scarps facing each other, one of the pair lying along the base of the hill, while the other is farther valleyward, feet, rods, or even miles from the hill scarp. The accompanying photograph [1] shows such a sunken block with bounding scarps facing respectively east and west and appearing as steep hill slopes. This occurs near the mouth of Little Cottonwood Canyon, in Salt Lake

FIG. 7.—Section of City Creek Delta, near Salt Lake City. Provo level of Lake Bonneville.

Valley, and the fall of the block has carried down part of the moraine of the Little Cottonwood glacier. (See Gilbert, *T. Cit.*) At first sight it may be taken as a stream-cut gap, but a study of the local drainage conditions, and an examination of the steep walls will dispel the assumption and prove the fresh fault exposure. On the east or mountain side the scarp has its raw face revealed to a height of sixty feet, while on the opposite side the height is about half as great. The fault which here appears traverses the north moraine of the glacier; on the other side of the canyon-mouth the south moraine is similarly traversed, but the depression has been less and the scarp appears to run up the moraine as shown in Fig. 7, p. 466. Southward for a few miles the scarps are traceable as they pass from moraine to moraine, with a visible throw deceptively small owing to the

[1] *Lake Bonneville.*

ready filling-in with loose material. Still farther south the fault runs on, and appears with great distinctness in the American Fork delta, with a scarp sixty to seventy feet high near the mountain and a smaller exposure along the flood plain of the stream. The deltas of Utah Valley, formed by Rock Creek, Hobble Creek, and Spanish Fork River, are generally faulted, and in some instances are given a stepped or terraced appearance.

In this brief mention of fresh secondary faults at the eastern edge of the Bonneville Basin we began with the depressed block near Cottonwood Canyon. Proceeding northward from this point, the same fault or series of faults may be traced across the mouths of canyons and ravines

Fig. 8.—South Moraine, Little Cottonwood Glacier, with fault scarp ascending the moraine.

through Salt Lake, Davis, Weber, and Boxelder counties. The post-Bonneville scarps may be followed for more than a hundred miles in a north and south direction; and beyond these limits the evidence of other faults is equally abundant, but they probably belong to series different from that herein described.[1]

Gilbert has ascribed the origin of the numerous secondary scarps along the Wasatch base largely to earthquake displacements, and he points to a seemingly close analogy between these faults and those which formed, practically under observation, in Owen's Valley, California, as

[1] For description and discussion of pre- and post-Bonneville faults see *Lake Bonneville*, chap. viii.; reproductions of sketches showing general features of the scarps over wider areas than can be covered by an ordinary photograph are incorporated therein.

incident to the earthquake of 1872. Referring to these latter he says: "As I saw them, eleven years after their formation, they appeared little fresher than some of the Wasatch scarps." Other instances of recent earthquakes and resultant fault-scarps are cited, and the application of these observations to the Wasatch faults is thus expressed: "It is legitimate to infer that the belt of fertile valleys that follows the western base of the great mountain range of Utah is an earthquake district, and this despite the fact that since its first settlement in 1850 no important tremors have been recorded. It is a matter of geological history that the Wasatch range is gradually rising, and that this rise is not uniform in time and place, but is accomplished by small and sudden displacements more or less localised, with intervals of rest. Of the lengths of these intervals we have no means of judging, and no one can predict the date of the next movement; but it is beyond question that such movement will take place, and that when it occurs the adjacent valley will experience an earthquake. Neither is it possible to predict with great confidence what portion of the district will be next affected, but if the orogenic force is approximately constant and the rhythm in its visible work is due to the necessity for accumulated energy to overcome friction, then the localities with fresh fault scarps may reasonably be assumed to be exempt from faulting for a longer period than those in which only ancient fault scarps are seen. Reasoning thus I was led to sound a note of warning in Salt Lake City, which stands close by an exceptional section of the range, where the fault scarps are so ancient as to be largely obliterated."[1]

The eminent authority on Lake Bonneville has not failed to repeat his "note of warning" as occasion has permitted. A letter from his pen appeared in a Salt Lake City daily[2] in 1883; and to insure its preservation it was reprinted in a scientific journal of note.[3]

With regard to the occurrences of earthquakes in the populated parts of Utah, the facts are that during the period of civilised occupancy, now fifty-five years, no seismic disturbances of alarming magnitude have occurred, though slight tremors are very frequent within the Bonneville Basin, and particularly along the Wasatch base.

Is it not probable that the existence of fracture planes is rather a safeguard than a danger with respect to earthquake disturbance? The existence of such planes in great numbers is evident from the surface scarps and from the slickensides disclosed by artificial excavations. It would appear as probable that such planes may be really planes of easement, comparable in effect perhaps to the sutures in the animal skull, whereby movements and even fractures may be confined to very narrow limits. The resistance to crust movement in such a broken region would be lessened, and there would be less opportunity for the "orogenic force" to accumulate destructive energy before relief would be found.

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[1] *Lake Bonneville*, pp. 361, 362.

[2] *The Salt Lake Tribune*, September 20, 1883.

[3] *American Journal of Science*, 3rd series, vol. xxvii., Jan. 1884, p. 49.

Glacial Phenomena.

But few instances of glacial action appear at elevations as low as the old lake margin anywhere within the Basin. The region is outside the area of general glaciation, and the common evidences of ice erosion and deposit are usually thousands of feet above the Bonneville level. A notable exception is observed within the Salt Lake Valley near the mouths of Little Cottonwood and Dry Cottonwood canyons. Emmons first directed attention to the fact that at this place glaciers reached the margin of the ancient lake.[1] The great height of the adjacent mountains and the adequate area of the catchment region probably explain the

Fig. 9.—Railway cutting through South Lateral Moraine of Little Cottonwood Glacier.

exceptional extension of ice streams to so low an altitude. There the glaciers probably set their icebergs adrift in the Bonneville sea, and the occasional occurrence of erratics in the lake beds of the valley may be thus accounted for.

Erratic blocks of granite inside the canyon, and these together with great moraines just beyond the gateway, attest the dimensions of the ice stream. The south moraine is of typical form, with a crest about 350 feet above the present canyon floor; the moraine on the north is lower, and more irregular, but not less distinct. Several other moraines occur as laterals to the south, and these extend into the valley to the distance of about a mile, where they merge with the terminals and with the alluvial sediments.

[1] *Exploration of the 40th Parallel*, vol. ii. p. 354.

A special interest attaches to the occurrence of glaciers within the lake area, as pointing to a possible indication of the age of the lake flood. A study of the deposits formed by the Cottonwood glaciers, of which three distinct streams are recognisable, indicates two periods of abundant ice accumulation separated by an inter-glacial epoch. A corresponding condition of dual ice work is indicated for the glaciers of the Nevada Basin to the west. Let it be remembered also that the lake deposits of both Bonneville and Lahontan show two periods of maximum flood with an inter-lacustrine period of arid conditions, and a time correlation of these two series of related phenomena is forcibly suggested. Investigations up to this date indicate a close coincidence between the times of maximum flood and of maximum ice accumulation. A correlation between the time of highest water and ice in the western part of the United States and the time of general glaciation in the east is tentatively accepted.

The Lake Beds.

While the exposure of an extensive series of rock formations and systems is made visible by the orogenic disturbances that have resulted in the elevation of the Wasatch and contiguous ranges, these do not enable us to determine with certainty the age of the lake beds. True, the lake deposits must be later than the youngest of the tilted strata of the mountain mass against whose sides the lake waters beat; and as later Mesozoic beds are thus tilted and folded into the mountain structure, the lake must be post-Mesozoic. In the lake floor, however, more evidence as to the true geological age is revealed. Tertiary beds occur in places, unconformably overlaid by lake sediments. A consideration of all the evidence at hand leads to the conclusion that the lake was a phenomenon of Pleistocene time.

Where the lake beds are most fully exposed, the members have been recognised; they are named in ascending order.

(1) Yellow clay, with local dashes of sand and nodular aggregates of gypsum; of this a depth of ninety feet is exposed, but the bottom has not been reached.

(2) White marl, a layer ten feet in thickness, overlying the yellow clay on an eroded surface. The lower part of the marl contains shells nearly identical with the shells occurring in the clay below.

(3) Sand, a top layer grading without break into the marl below, and presenting an average thickness of ten feet.

This succession of beds is less distinct on the slopes, and particularly so near the shore lines, where the lake sediments are mixed with littoral material. The eroded surface of the yellow clay indicates a break in the process of sedimentation, and this interruption is further attested by alluvial deposits and proofs of sub-aërial erosion between the yellow clay and the white marl. It is evident, therefore, that there are two distinct flood times in Bonneville history separated by a period of dryness. After brief reference to the probable conditions of pre-Bonneville time, Gilbert says: "There followed two epochs of high water with an interval during which the basin was nearly or quite empty. The first of these

epochs was at least five times as long as the second. The second scored its water mark ninety feet higher than the first, and would have encroached still farther on the basin sides had it not been checked by outflow. . . . The inter-Bonneville epoch of low water was of greater duration than the time that has elapsed since the final desiccation.[1]

Chemical Deposits.

As would be expected in the case of a lake that has shrunk to such an extent as has Bonneville through desiccation alone, deposits from solution occur in the lake beds. The occurrence of calcium carbonate,

Fig. 10.—Old Shore Line on Oquirrh Mountains. South end of Great Salt Lake. Salt pond in foreground.

usually as porous tufa, is common to the shores of most of the Pleistocene lakes of the Great Basin. The abundant accumulation of this material in the case of Lake Lahontan has received due attention from King and Russel.[2] In Lake Bonneville, however, calcareous deposition has taken place on a small scale only. Where this material occurs at all, it is found as an incrustation on the faces of cliffs, or as a cement coating the pebbles and holding them as a coherent conglomerate. Where once were quiet coves and bays, scarcely a trace of calcareous deposit is to be found, while the largest quantities occur where the waves produced the strongest surf action. It has been suggested that the aeration of the water probably promoted the precipitation of the calcium carbonate, and that the particles coalesced at the time of separation. In the open lake the

[1] *Lake Bonneville*, p. 316.

[2] *Exploration of the 40th Parallel*, vol. i. p. 514.

deposition of the carbonate went on in the usual manner, the particles remaining separate and forming an ordinary sediment. None of the Thinolite, named and described by King in connection with Lahontan and Mono lakes, has been found within the Bonneville boundaries.

As the retreating waters fell, the lake was divided into separate bodies, and the after-history of each lakelet was determined by its own conditions of local supply and evaporation. In the single instance of Utah Lake, the waters, if ever saline, have been freshened by the excess of supply and the consequent rinsing out. In all other lakelets evaporation has resulted in a highly saline condition, and in most cases in complete desiccation. (See Fig. 10.) In many of these small lake basins rock salt occurs, usually associated with gypsum. The gypsum is occasionally found as small free crystals, which on the Sevier Desert is drifted by wind action into great glistening dunes. Professor Russel estimates that the dunes in one locality contain about 450,000 tons.

Major Powell presents the following concise summary of Bonneville history: "First the waters were low, occupying as Great Salt Lake now does only a limited portion of the bottom of the basin. Then they gradually rose and spread, forming an inland sea, nearly equal to Lake Huron in extent, with a maximum depth of a thousand feet. Then the waters fell, and the lake not merely dwindled in size, but absolutely disappeared, leaving a plain even more desolate than the Great Salt Lake Desert of to-day. Then they again rose, surpassing even their former height, and eventually overflowed the basin at its northern edge, sending a tributary stream to the Columbia River; and last there was a second recession, and the waters shrunk away, until now only Great Salt Lake and two smaller lakes remain."[1]

GEOGRAPHY IN ITALY IN 1901.

By Professor Count Francesco L. Pullé, University of Bologna.

(*Translated from the Italian.*)

The first year of the century in Italy, so far as geography is concerned, was marked by two events, viz., the story of the voyage of the Duke of Abruzzi to the North Pole, and the Fourth National Geographical Congress, which was held in the spring at Milan. The original idea of these congresses emanated from the well-known Italian Geographical Society, whose headquarters are in Rome. They are held in a different city every three years. The first was held at Genoa in September 1892, on the fourth centenary of the discovery of America by Columbus.

The First congress was organised in three sections:—1st, Scientific, which included mathematical, physical, etc., geography. 2nd, Commercial and economical, *i.e.* political, statistical, social, etc., geography.

[1] *United States Geological Survey Report for* 1880-81, p. xvii.

3rd, Didactic, *i.e.* the study and teaching of geography in the schools of Italy. The work of the congress was developed in meetings of each section separately for discussion of special subjects, and in general meetings for commemoration speeches, for addresses by travellers, for questions of a general nature, and for discussion. There was also a geographical exhibition in connection with the congress, the contents of which were arranged according to the sections.

The Second national congress took place in September 1895 at Rome, and the Third at Florence in April 1898, the latter at the time when centenary honours were being paid to Paolo dal Pozzo Toscanelli and to Amerigo Vespucci. The Society for Geographical and Colonial Studies, which has its headquarters in Florence, and the Military Geographical Institute especially contributed to the organisation of the Third congress. This was considered one of the most successful and prolific in scientific results, thanks to the skilful and unwearied labours of its President, Professor Giovanni Marinelli, whose death shortly afterwards was a grievous blow to science.

At Florence a fourth section was added to the three named above, viz., historical, including the history of geography and cartography, historical geography and toponomastics.

The Fourth national geographical congress was held in Milan in the presence of the Minister of Public Instruction, Nunzio Nasi, under the direction of Senator Giuseppe Vigoni, who is President of the Society for Geographical and Commercial Exploration, with its headquarters at Milan. The number of the members enrolled in the congresses may give a fair idea of the interest taken in Italy in geographical studies. In the third congress at Florence there were 365 persons and 31 institutions and societies, but in the fourth congress at Milan there were 420 persons and 38 public institutions. The first congress at Genoa was attended by about 900 persons, but, as mentioned above, this congress was almost international in character, and half of those present were foreign guests. Thus we may calculate that the number of persons who take direct and active interest in the movement for geographical study in Italy is from 400 to 450. The programme of the work done at the Milan Congress will give a fair idea of the direction of these studies. We propose to give a *résumé* of it, following the order of the sections into which the programme itself was divided.

The scientific section was under the presidency of Professors Celoria of Milan and Filippo Porena of Naples, and had for its special business matters relating to Italian cartography. It is well known that the Italian Military Geographical Institute has contributed most to the development of geodetic and topographical science, and to the art of constructing, drawing, and reproducing maps in Italy. This Institute, which is also the executive organ of the International Geodetic Association of Italy, has for its principal object the geometric description of the territory of the State. Under the direction successively of Generals De Benedictis, Ferrero Annibale, and Viganó, assisted in technical and administrative matters by Colonels De Stefanis, Botto, Coen, Pezzani, and Gliamas, and a band of able topographers, both civil and military, it has,

besides other work, completed the most important work of the reliefs necessary for the construction of the GREAT TOPOGRAPHICAL MAP OF ITALY and its islands. Some reliefs were made in the scale of 1 : 50,000, and some in 1 : 25,000, according to the importance of the locality represented, and they have been photozincographed and are already available for any who care to study them or to possess a correct map on a large scale of the national territory. This work required a period of forty years, and is made up of 661 quadrants at 1 : 50,000 and 1005 tavolette at 1 : 25,000; in all 1666 sheets which include an area calculated approximately at 250 mq. It is on the basis of this relief work that the GREAT MAP OF ITALY is being constructed on the scale of 1 : 1,000,000, which when published will consist of 277 sheets, like the map on the scale of 1 : 75,000, which is also in course of publication. The Institute presented to the congress a specimen of its work in the shape of a catalogue of its publications, *e.g.* chorographic maps of Italy in 6 sheets at 1 : 1,000,000, and in 35 sheets at 1 : 500,000, a hypsometric map on the same scale, and various smaller maps.

Professor A. Baldacci revived a proposal for the preparation of an ethnographical map of the neighbouring Balkan peninsula. Such a proposal had already been laid before the Twelfth International Congress of Orientalists in Rome in 1899, and had been supported by the writer of this article, then General Secretary to the congress, but it was not approved, although Senator Urechia, the delegate of the Roumanian Government, offered a reward for the work. The Congress of Milan, however, passed a favourable resolution on this subject. Recent researches, such as those of Ripley in the *Races of Europe*, and of Deniker, in whose ethnographical map of Europe the region now under discussion has been left almost blank, show how important and desirable is an ethnographical investigation of the Balkan peninsula, including Greece.

The principal subject before the second section, *i.e.* the economico-commercial, was emigration, which is a grave problem in the Italian life of the present day. Already in the congress of September 1900, held in Ravenna by the Society Dante Alighieri, which busies itself with the extension of Italian nationality in foreign lands, having especial regard to language and to religion, the writer of this article had exhibited a map, showing the number of Italians settled in the old and in the new continent under two heads, viz., permanent and temporary, the total of which gives a number nearly equal to one-sixteenth of the total population of the kingdom.

Out of this there arose many subjects for discussion in the Milan Congress with reference to Italian colonial expansion (Professor B. Frescura), especially with regard to the emigration and agricultural colonisation of Italians in the Argentine Republic (G. Godio), the condition of the emigrants in that country (E. Rossetti), also temporary emigrations from different Italian regions (F. Musoni for Veneto and Friuli), how to maintain national spirit and traditions among those who emigrate (A. Franzoni), the new prospects of Italian emigration (V. Grossi). But the discussion reached its culminating point when Senator Luigi Bodio set forth the necessity of the law of emigration being thoroughly carried into practical

operation by private initiative. The remarks of Senator Bodio, formerly Director of the Bureau of Statistics in Italy, were favourable to the new laws of 1898, which regulate emigration in its relations to the State, and aim at bringing into line the work of the various private institutions now appearing in Italy with the work of the agents appointed by Government under that law. As a fact, the movement in favour both of studying and assisting emigration has become very active in Italy, and takes various directions, philanthropic, economic, or political; and it is specially stimulated by Catholicism on the one side and Socialism on the other, which struggle, each along their own line, for the protection of both the material and moral interests of the Italian workmen who stream forth into the markets of European and American labour.

The principal business of the third section, *i.e.* the didactic, was the discussion of reforms in the teaching of geography in Italian schools, both classical and technical, so as to give to this science a larger and fresher development. For this purpose it was pronounced necessary to strengthen the study of geography in the universities, where the teachers of geography are themselves taught. At present in Italy teachers of history and geography for secondary schools come from the Faculties of Literature and Philosophy, which are arranged quite differently from the corresponding Faculties in England and Germany. The Italian Faculty has only two degrees, one in Philosophy and the other in Letters, which includes Italian letters, Greek and Latin literature, history, and geography. In an Italian university the programme of study is not open, and any one taking a degree must follow for four years the programme prescribed yearly for all the universities of the kingdom. Geography is taught by only one professor, and the course of study is for one year. The majority of academic bodies have repeatedly declared themselves in favour of abandoning the present encyclopædic system, and of dividing the subjects of study in the Faculty of Letters into several branches, thereby necessitating a number of degrees, among which there would be one for history and geography. In this way it would be possible to widen and intensify the study of geography in the universities of Italy and to provide better trained and more experienced teachers for the secondary schools.

Now the Congress of Milan, at the suggestion of Francesco Bertolini, the illustrious historian and President of the Faculty at Bologna, passed a resolution in favour of the separation of the teaching of history and geography in secondary schools, and the institution of a separate degree for history and geography. At the same time proposals were formulated for the creation of separate chairs of physical geography and of mathematical geography in the universities. Besides this there was much discussion as to the limits of historical geography, and on the necessity of allowing both to historical geography and to the history of geography a much wider development among the other subjects of study.

It was recognised that for practical teaching it was necessary to have special rooms at the disposal of the professors in classical and technical schools, for the purpose of teaching pupils by practical exercises, and also special excursions, the exclusive object of which should be the imparting

geographical instruction to those who are to teach it. Among geographers who took an active part in the study and discussion of these problems were Professor Bertolini mentioned above, and Professors G. Dalla Vedova (University of Rome), Porena (Naples), Bellio (Pavia), Bertacchi (Palermo). Taramelli (Pavia), Guido Cora (Turin), and the following teachers: Signors O. Marinelli and Sensini (Florence), G. Bruzzo and A. Mori (Bologna), Minutelli, Amati, Viezzoli, Gennari da Lion, and others.

The fourth section, *i.e.* the historical, brought into notice a subject broached already in other congresses and developed at a general meeting in the Congress of Milan, *i.e.* a plan for an Italian Dictionary of Place-Names. Through the delightful work of J. G. Taylor on *Words and Places*, the reconstruction of history and the study of ethnological and linguistic changes by means of the remains of local names become more and more attractive and of ever-increasing importance. It fell to Graziadio Ascoli, the great Italian glottologist, to lay the foundation of toponomastics in the peninsula. The Archivio Glottologico Italiano, which under his able direction had been the organ for teaching the study of dialects, was of course the centre of the new toponomastic work, and has extended its authority over both glottology and geography.

After the essays regarding the origins of the various lists of place-names in Italy by Giovanni Flechia, the illustrious colleague of Ascoli, there appeared on the same subject papers on Tuscan toponomastics by B. Bianchi, and an essay on the place-names of the Valle del Serchio e della Lima, by Silvio Pieri, which is in truth a model of methodic and complete exploitation of a given locality.

Already at the first Congress of Genoa, at the suggestion and on the responsibility of Ascoli, the question of a vocabulary of place-names was brought forward by Bianchi. A resolution was also proposed a second time, which had been passed on another occasion by the International Geographical Congress of Venice in 1881 at the instance of Bartolomeo Malfatti, *i.e.* for the compilation of an Historical Geographical Glossary of Italy in the Middle Ages, on the model of an analogous work carried out by Oesterly in Germany, and with the help of other lesser works, such as the *Historical-Geographical Dictionary of Friuli from the seventh to the twelfth century* by the Comte de Prampero, presented by him to this very congress at Venice. The method and the measures recommended for the work were set forth the year before in a letter written by Ascoli in Milan on the 26th March 1891 to the Director General of Statistics (Luigi Bodio) on the compilation of an Italian Toponomastic Dictionary. This memorable letter was the point of departure for all studies preparatory to the ponderous work of Italian toponomastics.

The Congress of Rome also in 1895 had given its attention to the study of this problem, but after the Congress of Florence toponomastics became one of the most important subjects of the historical section.

Ascoli in the letter mentioned above had pointed out that the census of the population would be the quickest and most direct way of ascertaining the total number of local names where places are inhabited. He observed correctly that the topographical maps, together with the maps

of localities where a tax on ground-rents is in force, are very far from showing the number of the names existing locally in Italy, and besides this many localities are not subject to taxation of ground-rents. According to the estimate of Ascoli the total number of place-names for the peninsula should be about half a million. The official position of Senator Ascoli, and above all the great authority he enjoys among all ranks in Italy, made it certain that in the general census of the population which was to be taken on the night of the 9th February 1901, both his own proposals and the wishes of those who desired exact details with regard to the various problems of place-names would be carried out. Senator Bodio, a well-known authority on statistical science, who directed the working of the census, did indeed welcome the proposals of Ascoli in support of the proposals of the Congress of Florence, and in the census papers, in addition to information regarding the commune and the parish, he ordered the insertion of the name of the street or road, the square or market, and of the hamlet. Thanks to these last questions, we may anticipate that the number of place-names will be multiplied at least tenfold as compared with those of former censuses.

The census was then carried out on these lines and resulted in the accumulation of much good material; and if the Minister of Public Instruction, supporting the Office of Statistics, will preserve and utilise the precious harvest gathered in the census returns, and thus further the wishes, the hopes, and the labours of more than thirty years of Italian linguists, geographers, and historians, guided so far on the way by the brilliant conceptions of G. Ascoli, the ideal of an Italian toponomastic vocabulary is very near realisation. That is to say, one result of the census will be a very copious Statistical Dictionary of Place-Names. The preparation of this will be easily enough brought to perfection by revision, region by region, at the hands of skilled experts competent to reproduce in accordance with the rules of rigorous transcription the kindred names, wherever they are found.

But the general advantage gathered from the names of inhabited places, although it may be the conspicuous, perhaps the principal, part of the general toponomastic treasure, is not all. Ascoli himself had wisely pointed out in his brief words of preface to the essay by Pieri, that the names of waters, rivers, torrents, fountains, small lakes, etc., just like the not less important names of the various ranges of mountains and hills, are the most difficult to ascertain. Moreover, even in topographic maps on a large scale, names of places are under great disadvantages from want of space, for which reason hydrographic and orographic philology is obliged to have recourse greatly to those public institutions whose business is to describe physical and civil Italy.

This correct consideration induced him to think, that materials connected with orography and hydrography, and generally whatever does not fall within the exact definition of an inhabited place, would be found in the work which has been already mentioned, viz., the Grand Relief Map of Italy prepared by the Military Geographical Institute. For this reason, at the Congress in Florence, the President Marinelli and the Secretary Pullé prepared a plan for the utilisation of this source with the

help of an able topographer of the Military Institute, Signor Crivellari, who had devoted many years to the preservation of place-names in the exact form in which they had been found on the spot, before the changes and eliminations rendered necessary by the method and requirements of the preparation of the map. Experiments made tavoletta by tavoletta in separate quadrants of the map showed that the measure of gain per tavoletta of the relief on a scale of 1 : 25,000 was a total average of 260 names = 2·82 per square kilometre, and for a quadrant on a scale of 1 : 50,000 the number of 440 names = 1·15 per square kilometre. Over the whole surface of Italy on the zone mapped in the scale of 1 : 25,000, which includes 83,000 square kilometres, there would be space available for 235,000 names; and in the zone mapped on the scale of 1 : 50,000, which includes 203,000 square kilometres, there would be room for 235,000, or a total of 470,000, which corresponds with the calculation already made by Ascoli as likely to be the general total for all Italy.

The proportions of the various geonomastic lists can be conjectured from a work by Signor Crivellari in conjunction with Professors Ulrico Martinelli and Pullé in the *Proceedings* of the Congress of Milan. The work in question was about the Alpine Department of Bormio, including the three communes of Bormio, Valfurva, and Valdidentro, contained in Quadrants I.-III., sheets 8-9 of the Map. The names were distributed thus:—

	Bormio.	Valfurva.	Valdidentro.	Total.
1. Orography,	28	75	104	207
2. Hydrography,	3	25	36	64
3. Agriculture,	1	3	3	7
4. Provincial Districts,	2	2	...	4
5. Inhabited Regions,	14	84	94	192
6. Archæology,	...	2	1	3
Total,	48	191	238	477

The good effects of the study and discussions of toponomastic subjects in the national congresses have made themselves felt. The intelligent supervision of the Military Geographical Institute, in the hands of General Viganò, assured those in the Milan Congress who were interested in the work that all future editions of the materials required for the preparation of the great map of Italy will be cared for in accordance with the resolution of the third conference at Florence. It is also to be hoped that the resolution of the fourth Congress of Milan is now being carried out, viz., to preserve the results of the inclusion of names of inhabited places in the returns of the last Italian census. The resolution on this subject, which was proposed by the writer of this article, runs thus:—"The Congress passes an earnest resolution for the prompt gathering in of the toponomastic parts of the census returns, and that the lists of place-names should be intrusted to an expert in dialects for collation before the papers are dispersed. Considering also the supreme importance attached to toponomastic results, not only for politicians intrusted with the administration of the

State, and for the public and commercial interests of the people, but especially for history, archæology, ethnology, and linguistics, the Congress adds a resolution, that the cost of the completion of the lists of names from the census returns should be borne by Government in the Statistical department, as that is the Italian Institution which, under the skilful guidance of Senator Bodio, assisted by Signor A. Bosco, has acted along with the Geographical Institute, and offers every guarantee for uniformity and thoroughness of work, along with both mathematical precision and scientific knowledge." This resolution was carried unanimously, and we may hope that the Italian Government, to whom we look to carry it out, will understand its importance, and will prosecute the work as long as fate and the laws of nature preserve to Italy the brilliant and fruitful intellect and administrative powers of Graziadio Ascoli.

The number of those interested in toponomastics increases daily, and they become animated with new force. To the well-known names of Bianchi, Pieri, Carlo Salvoni, professor in Pavia, and successor to Ascoli in the Archivo Glottologico Italiano, and Professor Ricchieri of Messina, we may add those of Cesare Battisti, Olinto Marinelli, Tito Zanardelli, Gabriele Grasso, Salvatore Crotta. The Lombard Institute of Science, Letters, and Art, at the suggestion of Ascoli, has advertised a prize competition for the toponomastic exploration of a specified tract of Lombardy, and we hope its example will be followed by other similar institutions. So also in the programme of the Historical Congress to be held in Rome, the history of geography, historical geography, and toponomastics will be worthily represented.

In the same section Professor A. Rolando of Milan read an article on the "Western Frontier of India and its New Aspect." The rearrangement of the Western Frontier, which the Government of India has just effected, was perhaps suggested by the necessities of administration, but besides this it is significant of a remarkable fact in historical geography. India has on the west two lines of frontier almost parallel to each other, which separate it from the region of Iran; one follows the course of the river Indus, and the other the course of the Hindu Kush and Sulaiman ranges. At all times the river Indus has been considered the ethnographic frontier of India. The Hindu Kush and Sulaiman ranges of mountains were its natural and geographical frontiers, while in the first half of the nineteenth century they became its political frontier. But the two frontiers have never separated the Indian region from the Iranian or its races, its states, or its civilisation. Traces of Indian ethnography are found in Iran, but history does not tell us that emigrants from India ever entered the Iranian plateau. On the other hand, from time immemorial Iran continued to pour its people into India, beginning with the Aryans in the first dawn of history, and finally coming to the races which dominated Iran in modern times, *i.e.* Turks, Arabs, which founded states in Iran, and extended them beyond its mountains and beyond the Indus, and established new states in the peninsula, such as that of the Mongols, which in the seventeenth century practically comprised all India. It was only in the first half of the nineteenth century, after the English had

conquered the kingdom of Lahore and the Ameers of Sindh, that the mountains became an effective frontier—that is to say, from being a natural frontier they became a political one. Not even then, however, was this fact recognised and announced. To-day, however, by the new readjustment of the frontiers of that region, India has received a scientific frontier in accordance with its geography and history.

The southern part of the tract between the Indus and the mountain range which adjoins Baluchistan has been constituted a province with military frontiers, and so also has the northern part, which adjoins Afghanistan and which hitherto had been a part of the Punjab or Government of Lahore, from which it was separated by the Indus. Thus the whole tract between the ethnographic and the geographic confines of India will have a special administration with a military frontier, and the two frontiers will have definite functions such as they never had before, the one being in one way an administrative frontier, and the other a scientific. This administrative readjustment of the western frontier of India should be pointed out to those interested in historical geography.

I have thought it useful, for the information of the Royal Scottish Geographical Society, to give this summary of the work done collectively by those Italians who are interested in geography, and of matters closely related to it. There is an ulterior object also in view, viz., we have been able to give a *résumé* of the details of work done by students of this science, which from day to day is being more and more developed in conformity with the traditions and the position of Italy in the world.

Postscript.—Since the above was written, the division of the degrees in the Faculties of Philosophy and Letters has become an accomplished fact, thanks to the efforts of the Minister Nunzio Nasi, the energetic reformer of the Italian Universities. Now History and Geography constitute a degree distinct from those of Classical Literature, Modern Literature, and Philosophy, and more profound and extended studies are permitted in each of these subjects, to the sensible improvement both of knowledge and of methods of instruction.

The Minister Nasi is likewise now ordaining that the scheme for an Italian Toponomastic Dictionary should be carried out under the direction of Ascoli, and with the co-operation of the Academy dei Lincei, the work being accomplished by experts by means of the decennial vote of the Congress.

DISPUTED QUESTIONS IN ZOOGEOGRAPHY.[1]

It is well known that zoologists divide the globe into a number of regions according to the distribution of animals, especially mammals; and much has been written on the question as to which division best expresses the known facts of geographical distribution. The most familiar

[1] Abstract of a paper by Dr. Otto Maas in the *Geographische Zeitschrift*, viii. 3, 1902.

division is that suggested by Sclater for birds, and adopted by A. R. Wallace for mammals. This recognises the following six regions: Palæarctic (Europe and temperate Asia), Ethiopian (Africa), Oriental (India and part of the Malay Archipelago), Australian, Nearctic, (North America), Neotropical (South and Central America and Mexico). Many modifications have been in recent years suggested in this scheme, but side by side with these attempts to improve it there have not been wanting criticisms of a more destructive kind. Some authors have maintained that it is impossible to express the facts of distribution in any simple division of the world's surface into regions, and that the attempt leads merely to a distortion of the facts. In the paper before us, Dr. Otto Maas deals with one of the most recent of these destructive criticisms, and maintains in face of it the traditional position, while fully admitting the difficulties which the zoogeographer must face in his special branch of study.

The criticism in question is contained in a book recently published by P. and F. Sarasin, on the fauna of the island of Celebes in relation to the geological history of the island (*Ueber die geologische Geschichte der Insel Celebes auf Grund der Tierverbreitung.* Wiesbaden, 1901). As their title indicates, the authors of this work prefer to consider the animals of Celebes in their relation to its geological history, without stopping to discuss the to them barren question whether the island belongs to the Oriental or the Australian region. Their primary object is to learn from the fauna what relations Celebes has had, in geologically recent times, to the neighbouring land-masses.

In the first place they devoted themselves with especial care to the study of the terrestrial and fresh-water Molluscs of the island, comparing them as regards, not genera, but species, with those of the neighbouring islands. Their first conclusion is that the presence of numerous identical species of land or fresh-water Molluscs in land-areas now separated by sea, is proof positive of a former land-connection, for they consider that the chances of the passive means of distribution, as by birds, etc., have been greatly overestimated. For example, although water-birds are very abundant in Celebes as well as in the other islands, they have never brought from the Sunda Islands or from New Guinea any of the Unionidæ, which are abundantly represented in both the last named. Again, their conclusions have for the most part been based on the positive evidence of the presence of the identical species in two areas, and not upon the negative evidence of the absence of certain species, for this latter kind of evidence they consider to be less reliable in nature.

The study of these Molluscs, then, discloses the following facts. In the first place the endemic forms show a marked difference as regards distribution from the forms represented elsewhere. While the latter are widely distributed over the island, the former exhibit a marked localisation which is a proof of their different origin. There is a considerable difference between the genera represented respectively in North and South Celebes, while in the middle of the island these two faunas are intermingled. A census of the species in Celebes as compared with those

of the neighbouring islands, shows in the first place a much closer connection between Celebes, especially South Celebes, and Java than between Celebes and Borneo or Sumatra. Of twenty-six common species, twenty-four are common to Java, thirteen to Sumatra, eleven to Borneo. With Java South Celebes has indeed as much in common as it has with North Celebes. With Borneo, in spite of its proximity, Celebes has had no immediate connection in recent times. On the other hand, it has had a recent connection with the Lesser Sunda Islands, especially through Flores. The relations between the lesser islands show that Wallace's line—the strait between Bali and Lombok—separates two molluscan faunas, as it separates two mammalian faunas, but this line of separation is as regards Molluscs less important than the Straits of Macassar, which is an older plane of division separating the very distinct faunas of Celebes and Borneo. The relations between the molluscan faunas of Java, Sumatra, and Borneo show that the first and third have only been connected by means of Sumatra, just as Celebes and Borneo have only been connected by means of Sumatra.

Again, the land and fresh-water Molluscs of North Celebes show that there has formerly been a connection between this part of the island and the Philippines and the Moluccas respectively, while the Philippines have been formerly connected to Borneo, and the Moluccas to New Guinea. It may thus be said that the island of Celebes has been connected with the neighbouring land-masses by four land-bridges, two southern, one with Java and one with Flores, one northern, with the Philippines, and one eastern, with the Moluccas. The part played by these bridges is indicated in the following figures of the species common to Celebes and the neighbouring islands. Of all the species present in Celebes, 44·7 per cent. are common to Java and the Philippines (which were formerly connected by Borneo, see above), 15 per cent. to the Moluccas, 9·9 per cent. to the Lesser Sunda Islands. The land-connections with these islands must have existed in late-Tertiary times. A few of the land and fresh-water Molluscs of Celebes are to be regarded as remnants of older, middle-Tertiary migrations.

As to the other groups of animals in Celebes, the Sarasins find that the distribution of these generally confirms the conclusions drawn from the study of the Molluscs. Thus in regard to Amphibia and Reptiles, the number of forms common to Celebes and the different islands named above is in each case proportionate to their abundance in the islands. Further, there is no species common to Celebes and Borneo which is not also found in Java and the Philippines. In the case of birds, two-fifths of the species are endemic, and when the sea-birds and migrants are subtracted from the total, it does not leave a large number of species from which conclusions can be drawn. But on the whole the birds confirm the conclusion drawn from the Molluscs, of the fourfold connection with neighbouring lands, and the absence of any connection with Borneo. Of mammals which are non-volant and not endemic there are relatively few, but the authors believe that they also confirm the view of the fourfold connection. Their final conclusion is that Celebes cannot, without violence to the facts, be placed in any "zoological region," and that like

other parts of the earth's surface the history of its fauna can only be understood by the geological history.

Leaving aside the main thesis of the Sarasins' book, it is obvious that their results, in spite of their own rejection of the traditional position, so far suggest the possibility of a general treatment of zoogeographical questions, that they show that the fauna of a district does not consist of a number of isolated groups of animals, each of which must be studied separately. They found that conclusions drawn from the study of Molluscs were also applicable to such totally unrelated animals as the different classes of vertebrates. Therefore their results suggest that it is possible to consider the fauna of any given region as a whole. Wallace found that within limits the distribution of mammals agreed with that of birds, but the Sarasins' work has shown that this deduction may be extended further to cover several different kinds of animals.

In connection with the Sarasins' work, it is also necessary to note that it is not geological conditions alone which determine the distribution of animals; the biological factors also play a large part. Thus it is not sufficient to divide animals as regards diet into carnivorous, herbivorous, and omnivorous forms, for it is a familiar fact that a vegetable-eater may practically limit itself to one kind of plant, a flesh-eater to some particular animal, and so on. If animals be divided into monophagous, polyphagous, and pantophagous forms, it is easy to see that a monophagous animal, even if it is easily distributed by passive means, has less chance of survival in a new country than a pantophagous form. Similarly, while conclusions as to isolation, etc., may be drawn from the absence of a pantophagous animal from a suitable locality, no similar conclusion can be drawn from the absence of one of excessively limited diet, for this absence may be due to want of suitable food rather than to want of means of reaching the area.

Similarly, differences of temperature have a different significance in the case of stenothermous and eurythermous animals. Other things being equal, a eurythermous animal, that is, one capable of tolerating considerable variations in temperature, is more readily distributed than a stenothermous one, which can only live in places within a narrow range of temperature, and from the presence or absence of the eurythermous form in a particular locality, more important conclusions can be drawn than from the presence or absence of a stenothermous one. The same is true in regard to the relations of animals to conditions of moisture, etc.

Again, it is possible to a large extent to regard the fauna of a particular district as a community of living beings (cf. "plant associations"), not as a mere collection of individuals, and this community has had a common history. It is true that changes in the conditions act differently upon the different members of the community, but to a certain extent all show traces of their past history; in consequence, it is possible to regard the animal population of any region as an entity capable of treatment as a whole, and not merely as a collection of isolated problems.

But while this is true of a small and relatively uniform area, the matter becomes much more difficult when a large area of the earth's surface has to be dealt with. The problem which MM. Sarasin set before

themselves is greatly simplified by the fact that the area they chose is an island, and moreover an "abnormal" island which contains relatively few genera and species, and has the endemic species well defined owing to isolation. It is otherwise with many regions of the earth's crust, which are not absolutely marked off from surrounding regions, and yet display some special peculiarities which distinguish them as a whole from other parts of the surface. But on the other hand, it is to be noted that the absence of hard and fast lines is not a peculiarity of zoogeographical regions. In zoological classification a similar difficulty is experienced in drawing up definitions which shall be valid for all members of a group of animals, which shall distinguish absolutely between such animals and their nearest allies. This is especially the case when fossil forms are taken into account. It is not, however, necessary on this account to give up zoological classification, nor is it necessary to give up the division of the world into geographical regions, just because the boundaries of these regions cannot be absolutely fixed. The boundaries should not be given as dogmas, but as expressions of the present state of knowledge in regard to distribution.

The zoological regions, as originally defined by Sclater and Wallace, are certainly not all of equal value, for while the Australian and Neotropical regions are very distinct, the Ethiopian, Oriental, and Palæarctic are much more closely related to one another. True transitional regions, however, seem only to exist where temperate and tropical regions are separated by high ground. Thus between temperate and tropical Asia, between the Mediterranean region and Africa, between North and Central America, there are transitional regions whose boundaries it is almost impossible to define. This has been recognised by many authors, and numerous devices have been suggested to avoid the difficulty. Wallace, who recognised that the regions must be regarded as separated from one another by neutral territory, divided Asia into several sub-regions, the number of which was further increased by others. The best method of indicating the nature of the transition between the Palæarctic and Oriental regions, without an excessive multiplication of sub-divisions, is to recognise a central Asiatic sub-region which, together with a narrow belt of land south of the Mediterranean sub-region, and a belt lying between the Manchurian sub-region and the hot district of Further India, forms a debatable land between the two regions. The advantage of this arrangement is that it recalls the fact that the fauna of the hot Oriental region was once continuous with that of Europe and Asia, and the two were separated by an elevation of the land in Central Asia, which elevated land now forms the transitional region.

In America there is similarly a transitional region between the typical faunas of North and South America. Apart from that admixture of Neotropical forms which is conspicuous in parts of the United States, there is a singularly close resemblance between the Nearctic and the Palæarctic regions. There is much to be said for the plan of regarding the whole of the United States as forming a transitional region between the fauna of Canada, essentially Palæarctic in character, and that of the Neotropical region. This has not a few advantages over the ordinary

method of recognising a Sonoran region between the Nearctic and Neotropical.

Similarly, the islands of the Malay Archipelago form a transitional region between the Oriental and Australian regions, which are yet, in spite of this transitional region, sharply defined and very distinct from one another.

Another difficulty in the way of a thoroughly scientific treatment of zoogeography results from the far-reaching changes produced by the cultivation of so much of the surface of the earth by man. If it is still a paradox to say that man has produced over the whole earth a homogeneous fauna of his domestic animals, there can at least be no doubt that the numerical predominance of domesticated or partially domesticated animals has greatly increased the difficulty of dividing the earth into zoogeographical regions. The wild animals may be said to exist in the form of animated islands among the domesticated herds, and the existence of the protected and domesticated forms has greatly modified the bionomical relations of the wild animals to each other and to their surroundings. Although vast tracts of the earth's surface doubtless still exist, which are practically undisturbed by man, and where undiscovered mammals may yet lurk, nevertheless the rapid reduction, and even disappearance, of the great African mammals show how soon changes are brought about when the white man reaches these regions. It is very desirable that such parts of the globe as still retain, practically unaltered, their original fauna should be studied in as much detail as possible before the inevitable changes supervene. But even when these changes are finally consummated, and wild mammals have largely disappeared, the problems of geological distribution will not have vanished, they will still remain to be settled, even though they will be the problems of the past and not of the present. Just as we have before us the problem of the distribution of mammals since the time of their first appearance, so our successors will be concerned with these problems from the time of the first appearance of man until the time of his final supremacy.

Still other difficulties in zoogeographical methods relate to such facts as that there is much that is purely subjective in zoological classification. Species have not the same significance in the different groups of animals, and this gives rise to a possible source of error in discussing questions of distribution. Again, the history of the past is very imperfectly known, and it is customary to use the facts of geographical distribution to fill up lacunæ in geological knowledge, but as geological facts are used to fill up gaps in our knowledge of geographical distribution, the possibility that the reasoning follows a vicious circle is apparent. Similarly, the facts of geographical distribution are employed as evidence for the theory of evolution, and the facts themselves are at the same time interpreted by the evolution theory.

As an example of one of these difficulties, mention may be made of Wallace's treatment of the species of jay (genus *Garrulus*). He drew up a chart showing the distribution of the species, as favourable objects for the determination of geographical areas. But the twelve species which he discussed are not equivalent. Some are so nearly related as to be

perhaps merely varieties, others are very distinct. In view of the familiar fact that some systematists are exceedingly lax in admitting new species, while others are very strict, it is impossible for the zoogeographer to accept without examination conclusions based on species from one group only. It is necessary first to ascertain if such conclusions are borne out by other groups. For example, in the Galapagos Islands, the varied animals of different islands, such as the birds, tortoises, lizards, spiders, etc., all show analogous species or varieties. It is for this reason that Baur believes that the fauna could not as a whole have arisen from chance migrants reaching the islands at different times, but that the islands are the isolated fragments of a continental area.

Again, the frequent underestimate of biological evidence by geologists and of geological evidence by biologists, leads to constant disputes and obscurities. In no case is this better illustrated than in regard to the so-called "Relict-lakes," lakes believed to be remains of old sea-basins. The biologists are in the habit of postulating an old connection with the sea wherever organisms are present in inland lakes whose nearest affinities are with marine forms. Similarly, the geologists as readily assume that the "marine" forms may have been carried by some passive means if the geological evidence appears against the hypothesis of a former connection with the sea. In the region of the Malay Archipelago, again, the biologists demand many movements of elevation and depression to explain the distribution of the animals, while the geologists believe that the region has been stationary for a long time.

Not a few recent authors on geographical distribution have postulated very extensive movements of the land, and yet the geological evidence is strongly in favour of the view of the essential stability alike of the great ocean basins and of the great continental ridges.

Again, it is the custom to assume that two areas of the surface must have been formerly in connection with one another if the same species occur in the two regions, but this assumption takes no account of the fact that the very change in the geographical configuration which has led to the separation of the two areas should by hypothesis lead also to changes in the organisms. The nature and extent of these biological changes are quite undetermined, varying with each particular case, facts which greatly complicate the problem. Geographical distribution can in consequence never hope to be an exact science in the sense that the physical sciences are exact sciences, and the student of geographical distribution would do well to keep this fact always before him.

One final word as to the question to which province of science the study of geographical distribution belongs. The main factors upon which zoogeography depends are the facts (1) of geography, (2) of geology, (3) of biology, (4) of systematic zoology. As two of these lie within the sphere of the biologist, zoogeography in the strict sense must be regarded as a branch of zoology; the business of the geographer is merely with an exact representation of the facts: the geologist is only concerned with the distribution of animals in so far as it may cast light on his own special problems. To the systematist in zoology the study of distribution is likely to add a new interest and importance to his

special science. As a means of training in schools, zoogeography has been too much neglected, for it is a branch of science which is not only easily studied in nature and in museums, but is one which is full of interesting problems.

A SECOND TRANS-CONTINENTAL CANADIAN RAILWAY.

By Alexander Begg, Author of the *History of British Columbia.*

At the present time Canada has only one trans-continental railway line, namely, that of the Canadian Pacific Railway. The day is not far distant, however, when another through line will be constructed across the Dominion, which is intended to reach from the Atlantic Ocean to the Pacific —this line will be the *Canadian Northern* Railway. Its construction has been already begun, and the main line is now built from Port Arthur, on the northern shore of Lake Superior, to Winnipeg, and with a few westward connections had in operation in December 1901 1309 miles in its system.

The western portion of the *Canadian Northern* system will be continued *via* Fort Edmonton to Port Simpson, or some contiguous port on the Pacific: and will provide transportation for passengers and freight, between Yokahama and Liverpool, *via* Churchill, on Hudson Bay, should the latter route eventually be used, with a saving of distance between Yokahama and Liverpool of 1984 miles, in comparison with the route of the present trans-continental railway. There is no doubt that the new line will be much shorter than the Canadian Pacific Railway; but the exact distances can only be ascertained when the time-tables of the respective railways are published.

The proposed *Canadian Northern* Railway will open up in North-Western Ontario vast iron and mineral deposits, which have hitherto had to remain undeveloped for lack of facilities for transport. The rich and fertile Rainy River valley country, which contains, according to a careful estimate, not less than 800,000 acres of arable land, besides a large acreage suitable for grazing purposes, will be opened up. North-west of Winnipeg, the great valley of the Saskatchewan, with its healthful climate, fertile soil, and abundance of fuel and water, will be rendered available for settlement and capable of sustaining a very large population.

This second trans-continental railway will compete with, and reduce rates for the carriage of grain and other products to the east, and also for the carriage of eastern products for consumption in the west. A considerable portion of Manitoban grain, which has hitherto been shipped to Duluth, a United States port, will now be accommodated at Port Arthur. Nearly 100 grain elevators are situated on the lines of the *Canadian Northern* in Manitoba. One elevator, capable of storing more than a million bushels of wheat, is already completed at the lake terminals of the *Canadian Northern* Company at Port Arthur, and it is to

be followed by another of equal, if not greater size. The gradients on the section between Lake Superior and Winnipeg are arranged so as to facilitate the transmission of heavy trains from the west to the east.

When the line along the great valley of the Saskatchewan is completed between Prince Albert and Edmonton (an approximate distance of 300 miles), an area of about eleven and a half million acres of arable land, suitable for farming purposes, will be available within a distance of 30 miles from the railway line. This area, if divided into farms of say 160 acres each, would form 72,000 farms, and calculating an average number of four to each family, would furnish homes for about 300,000 souls of a farming population. It would be no exaggeration to state that twenty million acres of good land will be found within a reasonable distance of the new trans-continental line, and this would afford, at the previous averages per family, homes for about 500,000 settlers. It would thus appear that more than one-twelfth of the whole population of the Dominion could be settled in Northern Alberta and east of the Rocky Mountains, in the region drained by the Saskatchewan and its tributary streams, which includes in its eastern slope Peace River and other fertile valleys, capable of accommodating a large population.

The climatic condition of the vast territory which will be opened up by the *Canadian Northern* Railway is so similar to the valleys and route formerly described, that it is only necessary to mention that towards Regina and the prairies northward the isothermal lines sweep more to the north as they proceed west towards Battleford, Edmonton, and Athabasca. A writer descanting on the fertility of the soil, the healthfulness of the climate, and the suitability of the region for settlement, says: "Winter usually begins about the second week in November, and continues until March. The season is cold, but the dry atmosphere of the higher altitude robs the cold of its power of penetration. Seeding is done in April, and harvest commences in August. Spring wheat yields abundantly, and successful experiments have been made in many parts of Alberta with fall wheat. Barley and rye are grown successfully everywhere. The cool summers of the north are the nurses of the oat crop, a sample of this grain, grown ten miles east of Edmonton, being awarded the highest honours at the Paris Exposition. Vegetables of all kinds flourish and mature, as do small fruits of all varieties. Most of the ordinary kinds of fruit grow wild in abundance. The native hay is unsurpassed for nutriment, and timothy is already grown in large quantities, though the abundance of wild hay has, so far, made its cultivation unnecessary. The fertile valley of the Vermilion river, lying more than 100 miles north-east of Edmonton, is already the home of large herds of cattle, doubtless the progenitors of many a shipload of 'the roast beef of England.'"

It is but reasonable to believe that with the arrival of the means of transport, the rapid settlement which has followed the entrance of railways to the other portions of the north-west will be repeated in the valleys referred to; and that settlements, villages, and towns will grow with the rapidity which has followed the development and opening up of other districts in those regions. Immigration reports state that in

the years 1898, 1899, and 1900 about 13,000 settlers arrived in Northern Alberta. The influx for the year 1900 was nearly triple that of 1899, and nearly doubled that of the former year. "Therefore," a close observer states, "it does not seem unreasonable to suppose that within a year from the completion of the *Canadian Northern* from Prince Albert to Edmonton, an army of 10,000 immigrants will have made their homes in the newly-opened territory, and that ten years later 150,000 people will populate this region, now comparatively unoccupied."

Owing to the similarity of soil, climate, etc., westward through the Peace River country, the remarks made respecting the Saskatchewan valley apply to a very large proportion of the Athabasca, Peace River, and Parsnip River valleys—through which the *Canadian Northern* Railway must pass on its route to the Pacific, at or near Port Simpson, so they need not be repeated. By crossing the Rocky Mountains at Yellowhead pass, British Columbia is entered, so the extended line from Edmonton—the *Canadian Northern*—must of necessity cross a portion of the celebrated (Gold) Cariboo district to Tête Jaune Cache, then follow the course of Fraser river, north-westerly, through Cariboo district, until the G. Portage, or Arctic Divide, is reached. From this "Divide" rivers run respectively north-westerly or south-easterly, towards either the Arctic or Pacific Oceans. The great mining district of Omineca is next crossed; at first the proposed railway will run north until the line which will be constructed to Churchill is reached; then it will take a westerly course to Hazleton on the Skeena river, where a line is now being surveyed to the sea-coast at Kitamaat. The line to Kitamaat may be used by the *Canadian Northern* for a short distance, along the Skeena to Port Simpson, where there is a magnificent harbour, opposite the Pacific Ocean at Dixon Entrance.

There is another British Columbian project afoot in connection with the construction and terminus of the *Canadian Northern* Railway. The railway contractors, Messrs. M'Kenzie and Mann, although their names do not appear in the document, had an Act passed at the last session of the Legislature of British Columbia, in the name of the "Edmonton, Yukon, and Pacific Railway Company," to which company a grant was made of five thousand dollars for each mile constructed of this railway (not exceeding 480 miles). The Act may be cited (short title) as "the Victoria and Yellowhead Pass Railway Aid Act, 1902." When the last spike was driven on the Ontario section of the *Canadian Northern* at Port Arthur in December 1901, Mr. D. D. Mann, at a banquet given by the people of Port Arthur, stated "that the company intended putting forth efforts to obtain second place as far as mileage in the Dominion is concerned, and hoped that the silver spike would be driven at the conclusion of the construction of a second trans-continental line within seven years.

GEOGRAPHICAL NOTES.

EUROPE.

The Lakes of Auvergne.—In view of the interest which is now being taken in this country in Lake Surveys, attention may be drawn to a very interesting article by M. C. Bruyant in the *Revue Scientifique* on the lakes of the Auvergne district, with special reference to their fisheries. The lakes are of much interest on account of their diversity. It is well known that the Auvergne district—the "roof of France"—is largely composed of volcanic rocks of different ages superimposed on Primitive rocks, and gashed by depressions in which lie beds of Tertiary age. In some parts of the plateau the volcanic cones have sunk beneath the weight of the lava, or have been largely washed away, but elsewhere they persist, and bear on their summits crater-lakes, sometimes of considerable depth. In some cases the shape of the lake-bed is so remarkable that geologists have explained the cavity as due to direct subsidence or to an explosion. Of such crater-lakes the type is Pavin, a body of water of very remarkable aspect. Then again, in addition to the volcanic cones, the district contains many lava-flows, which flowed down or across the valleys and have in consequence greatly altered the drainage system. The surfaces of these lava-flows form stony wastes, called *cheires*, where vegetation can obtain little or no foothold on account of the extreme aridity. The lava behaves to the ground beneath almost like a glacier, so that at the extremity of the flow there appear copious springs and streamlets, carrying the water which has drained from the volcanic slopes, or trickled through the porous lava-crust. The result is that the ground beneath the lava is hollowed out by the action of water, so that there are sometimes vast subterranean reservoirs formed beneath. The most celebrated of these is the "Creux of Soucy," situated not far from Besse, in the *cheire* of Montchalme, to the south of Pavin. The Creux is 60 metres long and 40 metres broad. Beneath the cupola of lava lies a little lake about 12 metres deep. Owing to evaporation its temperature is permanently maintained at about 0°, and though the vault of lava is pierced at its summit, the water is almost completely shaded from the light. Within the lake only small animals and plants were found, notably the diatom *Asterionella formosa*, in spite of the deep shade. Still another type of lake- barrier-lakes- is formed where the lava-flow has crossed a lateral valley, or where the drainage has been blocked by glacial detritus.

As to the characters of the different types of lakes, Pavin may be taken as an example of a crater-lake. The waters of this lake occupy the base of an immense cirque, whose steep walls are clothed with beech and fir. The lake has a superficies of 44 hectares and a depth of 90 metres, and its waters are marvellously clear. Lakes of the same type are those of Tazanat and Chauvet. Barrier-lakes formed by a dam of lava are often devoid of a visible outlet, the overflow waters trickling through or beneath the *cheire* which dams them back. Such lakes are those of Aydat, La Landie, and Guéry. Finally, such lakes as Les Bordes, Laspialades, and Crégut, are due to glacial action.

In regard to the fish of the lakes, almost all contain minnows and sticklebacks, the latter of which are important at certain seasons as food for trout. The minnows are remarkable for the periodical migrations which they undertake from one lake to another by means of small streams, or even at times over damp ground. Most of the lakes also contain perch and tench, while bream, carp, gudgeon, bullheads, and others are less frequent. The most interesting species is the trout,

which reaches a considerable size in the lakes, and differs in general characters in the different lakes. In several of the lakes attempts have been made, with a considerable measure of success, to improve the fishing by modern methods of pisciculture.

The Ben Nevis Observatory.—A notice has been widely circulated in the public press to the effect that the Meteorological Observatories, both at Fort William and on Ben Nevis, will have to be closed in October for want of funds to keep them in operation. During the last four years the liberality of Mr. Mackay Bernard of Dunsinnan has made the continuation of the work possible, but the directors consider that the only hope for the establishment of the Observatories as permanent institutions lies in State assistance. Since the work was begun in 1883 until the present the total cost has been £24,000, of which nearly £17,000 has been supplied by subscriptions. Since 1883 the Meteorological Council has given a grant of £100 per annum for the Ben Nevis Observatory, and since 1890 a grant of £250 per annum for the Fort William Observatory. This last grant is to be discontinued at the end of the year, whether the Observatories are continued or not. The prospect that the work must be abandoned must cause keen regret in all persons interested in scientific work, and we can only hope that some means will be found whereby the necessity of closing the Observatories in October may be obviated.

Earthquake at Salonica.—On Saturday, July 5th, a severe earthquake shock, lasting twenty seconds, occurred at Salonica. Before the news reached Vienna the instruments at Laibach Seismological Observatory registered a great disturbance towards the south-east at an estimated distance of 600 miles, the true distance between the two places being 560 miles. The shock was also recorded at Birmingham at a distance of 1440 miles. Though the effect produced at Salonica itself was not great, some of the neighbouring villages suffered severely. At Bani more than 200 houses were destroyed, at Guvezno 150, and at Karajere 50. A new spring burst out at the mineral baths of Langaza. The shocks were continued from Saturday afternoon till midday on Monday, and were accompanied by a very cold wind.—*Nature.*

ASIA.

Expedition to the Pamir Desert.—M. Boris Fedtschenko has recently returned from a scientific expedition to the elevated Pamir desert with a singularly rich collection of plants. Not only has he obtained a large number of new species, but he has been able to ascertain the existence of many plant associations, and to study the distribution of the members of the flora according to modern scientific methods. The plants obtained at an elevation of 5000 metres show some remarkable adaptations to the very unfavourable conditions of existence. As was to be expected, the terrestrial fauna proves to be poor, but some interesting insects and lizards were obtained.—*Le Mouvement Géographique.*

Expedition to the Thian-Shan Mountains. Dr. G. Merzbacher, the author of *Aus den Hochregionen des Kaukasus*, left Munich in May last on an expedition to this region, especially the eastern and central part of the range. He was accompanied by M. J. Keidel, a geologist, by an engineer, M. H. Pfann, and by an Alpine guide, and proposes to attempt the ascent of Khan Tengri, about 7400 metres in height, which is the culminating point of the range. It is expected that the expedition will be absent from eighteen months to two years and a half.—*La Géographie.*

AFRICA.

Murchison Falls of Nile.—Mr. C. Stewart Belton gives in *Nature* an interesting account of these falls, which are situated near the post of Fajao. From below it is seen that the water takes its final plunge into a rock basin from a height of 200 feet. At a distance the falls have a peculiar intermittent roar, and on approaching the basin the cause of this is seen to be the fact that a mass of water tumbles headlong into the basin, then this is followed by an enormous broken wave, then by a lull, and the process is repeated. By means of a rough scramble the author succeeded in reaching the summit of the south cliff, and in ascertaining the cause of this peculiarity. At the top of the cliff he found a rocky plateau, marking the former level of the river bed. This is eaten out into pot-holes, the largest of which was fifteen feet in diameter and ten feet deep. Apparently the river had at one time swirled round a mass of gneiss in the centre of its bed, and finding a softer vein at the south side of this, has cut out a deep vertical cañon eighteen to thirty feet wide and of unknown depth. Above this cañon the Nile is a succession of falls, and, after a sharp bend to the north-west, turns again west when 200 feet wide, and, gradually narrowing, tumbles ten feet over a rock ridge spanning the river, and then over a five-foot ridge. For fifty feet it rushes onward with increasing velocity, and finally enters the extraordinary cleft or cañon mentioned above. Down this cleft the river slides for 150 feet, as a solid mass of water, until it suddenly meets with an obstruction, a harder layer of gneiss through which it is undercutting its way, and, striking this with terrific force, rebounds from the impact, sometimes with a huge shower of spray. Meanwhile the body of water behind has to find an outlet, and, being still confined between high walls, is forced over the obstacle with irresistible force, and, sweeping on for another 250 feet, finally leaps down the last fall into the rock basin below. Similarly the back wave, now converted into a vast boiling mass, follows hard upon it, and gives rise to the second sound of the fall, which is followed by a lull until the water once more gathers strength to leap the obstacle.

The Navigation of the Senegal.—The governor of French West Africa has instructed Naval Lieutenant Mazeran to make a hydrographical study of the Senegal with the view of improving its navigation. Lieutenant Mazeran intends to investigate the river-floods and to study the levels so as to ascertain if it is possible to improve the waterway. He believes that the part between Saint Louis and Saldé (450 kilometres), that is, about half the distance between Saint Louis and Kaze, could with but little outlay be rendered navigable throughout the year. Closely connected with the question of the navigability of the river is the problem of the extent to which it is possible to irrigate the soil of Senegal, either by storing the flood-waters of the river in a natural reservoir, such as Lake Guier, or by utilising the locks which it will be necessary to construct in the upper reaches.—*Le Mouvement Géographique.*

AMERICA.

Geography of Cuba.—Mr. G. W. Vaughan and Dr. A. C. Spencer were members of the party deputed to make a geological reconnaissance of Cuba, and give in the *Bulletin of the American Geographical Society*, xxxiv., a summary account of the geographical part of their work. A thorough comprehension of the topography is rendered difficult by the absence of any good map of the island, and by the lack of accurate information in regard to its geological structure. The highest

mountains of the island occur in the Province of Santiago, and are only slightly lower than the highest peaks of Jamaica and Haiti. From Cabo Cruz to the vicinity of the Puerto de Guantanamo extends the principal range—Sierra Maestra—which is continuous and of fairly uniform altitude except in the vicinity of Santiago, where the wide basin now partly filled by Santiago Bay cuts across the range. The northern mountains of the Province have not this continuous character, but are arranged in irregular groups separated by numerous river valleys. Towards the east this irregular range merges in the southern belt, while westwards the two ranges diverge widely. Between these divergent ranges is the Cauto valley, a broad undulating plain, widest towards the west, where it ultimately merges in the plains of Puerto Principe. In the Province of Santa Clara is situated the central mountainous region of the island; here the highest peak rises to an altitude of 2900 feet, and the mountains may be arranged in four groups. Another range occurs in the Province of Pinar del Rio, where the highest peak probably does not exceed 2000 feet in height.

Apart from these ranges of hills, the surface of Cuba is generally that of a low undulating plain. The northward-flowing streams of this plain have excavated their channels deeply so that only the level hilltops remain to witness to the former great extension of the plain; but the southward-flowing streams run in very shallow channels. Much of the plain, especially in the central provinces, is underlain by porous limestone, so that there is extensive underground drainage. Over large areas the limestone has weathered into black or red clay, forming a soil of great fertility. Red clay of this kind constitutes the soil of the vast sugar plantations in the provinces of Habana, Matanzas, and Santa Clara. Certain portions of the plain in the vicinity of the highlands have a superficial layer of sand or gravel derived from the mountains, and this greatly diminishes the fertility of these districts.

Though the rivers and watercourses of the island are very numerous, none are of any great magnitude, and all are short. Harbours are numerous and excellent. Almost all have a characteristic pouch-shape, a narrow entrance leading into a large and more or less land-locked sheet of water. This peculiarity of shape the authors explain as follows. The harbours are drowned drainage basins, and the shape is due to the fringe of hard coral rock resting upon the softer limestones and marls of the coast-line. Wherever the conditions are at all favourable the coral polypes form a fringing reef at the sea margin. If elevation now takes place, the streams readily erode the soft rocks of the raised beach into a basin, but owing to the hardness of the peripheral band of coral rock, flow into the sea by narrow converging channels. Subsequent depression would convert the basin into a land-locked harbour. Such harbours are in many cases now in process of formation along the Cuban coast, *e.g.* a depression of thirty feet at Matanzas would flood a part of the Yumurí valley, and form a land-locked basin connected with the sea by what is now the narrow Yumurí gorge.

Expedition to Ecuador.—M. Bourgeois, who was the leader of an expedition sent to measure a terrestrial arc on the equator, gives an interesting account of the physical geography of the republic of Ecuador. The area included in the republic falls naturally into three regions—the low-lying plain which abuts on the Pacific seaboard, the Interandine region which lies between the two ranges into which the Cordillera here splits, and finally the eastern slope which descends gradually towards the plain of the Amazon. The mid or Interandine region is not a continuous valley, but much more a chain of cirques separated from one another by transverse ranges connecting the two main chains of the Cordillera.

The region stands at a height of 2500 to 3000 metres, and the transverse ranges separating the cirques rise to 5000-6000 metres. The cirques have a width of 25-40 kilometres, and the mountains encircling them are crowned with volcanoes, the giants of the Andes, some like Tanguragua in permanent activity. The interior of the great cirques is clothed by alluvial deposits, brought down by torrents from the surrounding mountains, or left by the glaciers of an earlier age.

The three regions differ much as regards their natural products. The coast plain, with its equatorial climate, bears much cocoa and coffee ; the eastern slopes, still clothed with virgin forest, produce rubber and many rare essences ; while the lofty Interandine basins bear cereals, especially maize, towards the south, and in the north their pastures feed vast flocks. The abundant population of the region is however due less to its natural wealth than to its almost temperate climate. The soil is continually slipping, so that railways laid in the dry season are swept away by the rains, and great crevasses are present in the middle of the pastures.

The population falls into three groups : the descendants of the Spanish conquerors, which form the dominant stock ; the Cholos, or half-breeds, comprising the bulk of the population ; and, finally, the pure-bred Indians. While the towns are European in aspect, the inhabitants of the Interandine region, if nominally Catholics, are pagan in many of their practices, and the dwellers on the eastern slopes of the Cordillera are still savages, and are grouped in tribes governed by caciques. The great obstacle to the economic development of the country is the absence of adequate means of communication. The roads are mule-tracks, furnished with very inferior inns, though a carriage-road, so-called, extends from Riobamba to Quito, along which a leisurely diligence travels twice a week. The railway from Guayaquil to Quito will this year be extended to Alausi in the Interandine region.—*Revue Scientifique.*

The West Indian Eruptions.—The whole of the July number of the *National Geographic Magazine* is taken up by reports furnished by various members of the Expedition to the West Indies, the place of honour being given to Mr. R. T. Hill's report. The letterpress is illustrated by some very fine photographs, which show in a most striking way the nature and extent of the devastation caused by the eruption. Mr. Hill believes that the cloud which destroyed St. Pierre came, not from the summit of Mount Pelée, but from a lower vent, about two miles north of the city. Although the composition of the cloud is uncertain, there is abundant evidence that it contained sulphurous vapours, and that violent explosions, accompanied by electric discharges 'lightning', occurred within it. The author believes that the destruction of the city was due to these violent explosions. He gives an interesting figure showing a heavy statue which was hurled to a distance of fifty feet by the great blast while its pedestal remained quite intact. Many similar instances were observed, showing that the blast travelled at a certain level above the ground, and was of a definite height, so that people, trees, and buildings above its plane of action were uninjured. In view of the great *human* significance of the catastrophe, it is of interest to note its slight *geological* importance : there were no lava-flows and no earthquakes, there is no alteration of the topography, no subsidence nor uplift ; from the geographical point of view, even, but little change occurred, for the area affected was relatively very small.

Origin of Streams in Florida.—Most of the streams in Florida originate in clear springs, which sometimes give rise to considerable lakes, or at other times flow off directly in bold rivers. In many cases the water boils up from the bottom of

a clear circular basin, having a depth of 30 to 40 feet, and with high sloping banks. The water is so clear that very small objects can be distinguished at the bottom, and large streams of water can be observed gushing up through the beds of limestone beneath. One of the most characteristic of the springs is that called Silver Spring, near Ocala, in Marion country. It is the head of Oclawaha River, and has been recently measured by the Geological Survey. The river flowing from the spring is 60 feet wide, and has a mean depth of 11 feet, a mean velocity of one foot and a quarter per second, and a discharge of 822 cubic feet per second. The spring basin is about 35 feet deep, and the temperature late in December was 72 F. Though the water has a slight limestone taste, it appears to have no other mineral constituents, and is excellent for drinking. Steamboats ascend the river to the spring basin, and have a regular landing-place there.—*The Journal of Geography.*

POLAR.

Colonisation of Novaia Zemlia.—Since 1894 the governor of Arkhangelsk has been endeavouring to colonise Novaia Zemlia by means of the Samoyedes. Those members of this race which have hitherto lived on the continent between the mouths of the Petchora and Iougor Char have become greatly reduced in circumstances owing to the spread of disease among their troops of reindeer, the progressive diminution of the game in the district, and the small amount of fish obtainable. In Novaia Zemlia, on the other hand, the conditions in these respects are much more favourable, and three permanent stations have been successfully established on the western coast of the southern island at Karmakul, Bieloucha, and Pomorskaya Gouba. During the summer 2000 to 3000 Samoyedes live in this region, and devote themselves to the chase of fur animals, bird-catching, and fishing, at which primitive crafts they do well. Twice during the summer a steamer from Arkhangelsk visits the island to bring the necessary provisions. During the winter of 1900-1901, 100 Samoyedes remained on the island and escaped the attacks of scurvy.—*La Géographie*, v.

The de Windt Expedition.—Through Reuter's Agency we learn certain details of the expedition conducted by Mr. Harry de Windt. The journey from Irkutsk to Yakutsk occupied a month, and from the latter place the party proceeded to Verkhoyansk, using reindeer. The road lay over precipitous mountains, and the cold was intense, the thermometer registering 78 degrees below zero. Next, the party pushed on to Kolymsk, and thence to Behring, suffering greatly from hunger and exposure. Finding little driftwood, they were unable to make a fire, and they slept in tents with the temperature 40 degrees below zero. For twenty days they lost their way. The journey from Kolymsk occupied seven weeks, and was made in sleighs drawn by dogs. After remaining at East Cape five weeks, they were taken off by the cutter *Thetis*, which landed them on the ice—the shore being quite unapproachable in the ship—five miles from Cape Prince of Wales. After a perilous journey of four hours over floes and open water, the party at last landed in America on June 19, just six months after leaving Paris.

Fate of Andrée.—A Reuter telegram from Winnipeg states that the Rev. Mr. Fairies, an Anglican missionary among the Eskimos within the Arctic Circle, has arrived there, and repeats the story, which was brought two years ago by an Eskimo to Port Churchill, that a band of natives found M. Andrée and party 300 miles to the north of Port Churchill. On approaching them M. Andrée fired a gun. The natives interpreted this as a hostile act, and set upon the explorers and

killed them. The Hudson Bay Company offered a large reward to the messenger for some relic of the party, but this was never brought. Mr. Fairies described an instrument resembling a telescope, which was taken from the outfit and carried, with other loot, to the Arctic Circle by the Eskimos.—*Nature.*

COMMERCIAL GEOGRAPHY.

The Hemp Industry in Kentucky. Mr. J. Brent Moore points out that the soil of Central Kentucky is eminently suited for the culture of hemp, which here gives a yield of 800 to 1600 pounds per acre, with but a small drain on the soil, and a product of high quality. Against these advantages must be placed the heavy expenditure in hand labour which is necessary for the separation of the resinous gum from the fibre. In Kentucky the gum is partially removed by exposure to the winter rains, and the lint then removed by crushing the stalks and beating out the herds. This has hitherto been done by hand on a portable wooden hand-brake, and is a costly and laborious process. Hemp culture was profitable enough in the slave days, when the full-grown slave was required to break 100 pounds of stalks or to cut half an acre. Above this quantity the negroes were paid at a regular rate, and sometimes accomplished more than three times their task in breaking, or duplicated it in cutting. With free labour hemp production no longer pays, labour being dear, scarce, and inefficient.—*John Hopkins University Circulars.*

Commerce of Yemen.—Of the whole of Arabia, Yemen is the region with the greatest natural resources, and the one which from its position is best adapted for commercial development. As yet all, or practically all its trade is carried on through Aden, and this only with considerable difficulty, owing to the uncertainties of the caravan route if the exports be carried by land, and the miserable vessels if the sea-route be chosen. A rapid increase in the trade would doubtless take place if the natural port of Hodeida could be utilised, and there would be no difficulty in establishing a direct route between Sana and Hodeida which would tap a populous district, and which could be constructed without difficulty. The only part of the route where difficulties present themselves lies between Mefhak and Metneh, a distance of about 33 kilometres. If this route were opened out then the town of Menakha, now decadent, would doubtless rapidly become a great commercial centre. The chief article of export of the district is coffee, which grows throughout a zone extending from Abu-Arish in the north to Taez in the south, though it all receives the name of Mocha coffee.—*Le Mouvement Géographique.*

Commerce of Congo Free State.—In the year 1901 the commerce of this State amounted to 73,590,458 francs, an advance of 1,488,949 francs on that of 1900. Of this total the exports amounted to 50,478,394 francs and the imports to 23,102,064 francs. The imports showed a diminution of 1,632,000 francs as compared with the previous year, this being due to the smaller quantities of railway and shipping material and of alcohol. This last decrease was certainly due to the increased duty, which has been raised from 15 francs the hectolitre to 70, with a corresponding drop in the amount imported from 12,346 hectolitres in 1902 to 1948 in 1901. The exports have increased by 3,110,999 francs: of these exports rubber accounts for 43,965,950 francs, ivory for 3,964,600 francs, and palm nuts and oil for the rest.—*La Géographie,* v.

Census of Tunis.—According to the census of December 1901, the civil population of French origin in Tunis numbers 24,201 persons, an increase of

7994 individuals on the 1896 census. Of these 72 per cent. live in the towns and 28 per cent. in the country. In the town of Tunis itself there are 9617 persons of French origin. Of the total French population 58 per cent. come from France, 22 per cent. have been born in Tunis, and 15 per cent. come from Algiers. The department of France which has furnished the largest contingent since 1896 is Corsica, from which 535 persons have come, while the Seine follows with 271, Bouches-du-Rhône with 210, and Haute-Vienne with 187. In industry and commerce 5796 and 4157 persons are respectively engaged, only 3265 in agriculture, while no less than 4386 are members of the Administration.—*La Géographie.*

NEW BOOKS.

EUROPE.

History of Scotland. "Cambridge Historical Series." By P. Hume Brown, LL.D. Cambridge University Press. Vol. i. pp. 408, with seven maps. Vol. ii. pp. 464, with four maps and plan. *Price 6s. per vol.*

This is an eminently satisfactory work, and we are glad that the original plan of a two volume history has been abandoned for an extension to three volumes. Of these, two volumes are now before us. The outstanding merits of the work are its comprehensiveness of view, its caution, and its vivid and accurate writing. It is also noticeable that a special effort has been made to observe throughout the due proportion of events, although in the earlier centuries this has not always been possible owing to occasional lack of materials. The most recent authorities are made use of. Thus the description of Dunbar Drove is at variance with the version of Carlyle and Gardiner, the author holding that the opinion of Mr. C. H. Firth on this battle is better founded. We also notice that the battle of Carham receives the prominence which is its due, and the same may be said of James vi.'s reign in its political aspect. The author sternly refrains from indulgence in a discussion of moot questions. The three or more theories as to the localities of Bannockburn are left aside. In the account of Queen Mary's times the Casket Letters are not even mentioned. So those who turn to the work for the latest disquisition upon some pet conundrum will often be disappointed. Extreme care in statement is evident, and the temptation to sacrifice accuracy to picturesqueness is successfully resisted. But this does not mean that the work is dry and uninteresting. It would perhaps be difficult for any history of Scotland to become so. Certainly Dr. Hume Brown is not open to the charge. His style is always vivid, and by careful selection and due notice of connecting links, he gives remarkable lucidity to his pages. The style of printing and the maps contribute to the clearness of the work, and we may specially mention the map illustrating the campaigns of Montrose, Cromwell, and Argyll. It adds to the interest of the story that contemporary dates in other countries are given, and the short bibliographies are useful. In the course of perusing the volume we have noted several points which appear open to question, but all are of such minor importance as to call for no remark here. When the third volume appears the addition of an index will be welcome.

Guide to North Wales. Part I. By M. J. B. Baddeley and C. S. Ward. London. *Price 3s.*

A new edition of this standard work has been issued, and is as reliable and as up-to-date as its predecessors. The volume is light and portable, but the hurrying

cyclist may perhaps complain that it is not even lighter, for the addition of a third in the form of advertisements (which include Strathpeffer, Skye, etc. will not commend itself to him.

ASIA.

The Nearer East. By D. G. Hogarth, M.A., Fellow of Magdalen College, Oxford. Late Director of the British School at Athens. With 30 Maps and Diagrams. Pp. 296. London: William Heinemann, 1902.

This volume belongs to the "Regions of the World" Series, edited by H. J. Mackinder, M.A., reader in geography to the University of Oxford, and the production of it probably could not have been put into better hands than those of Mr. Hogarth. By the Nearer East we have to understand in general terms all that part of Europe south of the Balkans, including Albania and Greece with the islands that belong to it: Asia Minor, Persia, Arabia, and Egypt. The first part of the volume comprises nine chapters, devoted to the description of the physical features of this large area: its mountains, plains, geological structure, climate, and vegetation. Although the first part is naturally less attractive to the general reader than the second, the chapter on "climates" gives a very vivid and interesting picture, drawn from personal observation, of the baneful effect of the prevailing winds from Siberia and the Sahara upon the vegetation of the Nearer East, and also how the high winds interfere with the navigation of the Ægean and Black Seas. We should like to have been told, however, whether the navigation between Crete and Egypt, or Cyprus and Egypt, is favoured or not by prevailing winds, as that has a bearing on the introduction of Egyptian articles into those islands and *vice versâ* in prehistoric times. Though Egypt is often looked upon as a good winter health-resort, we are told that its climate is really injurious to health, that longevity is rare, and the rate of infant mortality extraordinarily high.

Being very difficult of access, Northern Albania became a refuge for the older races of the Balkan Peninsula. Hence considerable interest attaches itself to the Geges, who are often believed to represent the ancient Illyrians. At home they are a most warlike and ferocious people, broken up into clans, addicted to blood feuds, and without any seaport. Yet when they migrate into other parts of Turkey they become comparatively industrious and useful members of society, given to seafaring, skilled labour, and even the learned professions. The ancient origin of the Geges is attested by their dark hair and dolichocephalous heads, while the southern Albanians or Tosks are fair, brachycephalous, and show an undoubted strain of Slav blood in their veins. They are more civilised and less clannish than the northern Arnauts.

The modern Greeks are also short headed, and have certainly incorporated many elements foreign to the ancient Hellenes. Perhaps this helps to account for the fact that although surrounded by water neither the Greeks of the Morea, of Crete, of the islands are a seagoing people, and few modern Greeks take to the sea by choice: their instincts are not maritime. In Eastern Roumelia the Greek element in the population is receding before the Bulgarian. In Macedonia the Bulgarians are also expanding at the expense of the Greeks, and the bulk of the Macedonians show unmistakably that their religious sympathies are with the Slav churches of the north. On the other hand Greek influence is gaining ground along the new lines of railway leading from the west coast of Asia Minor into the interior to such an extent that the population is becoming re-hellenised not only in civilisation but also in religion. With regard to the Vlachs, though

they do not generally count for much in the history of the world, "they have given both Turkish and Greek armies their most reliable fighters, and to liberated Hellas its best element of stability and progress."

Though a country much coveted by Russia, Persia does not seem a very desirable possession. It is gradually drying up like Turkestan, and only one-tenth of the plain area is under cultivation. The saline dryness of the climate is believed, however, to have a stimulating effect on the intelligence. "The typical Persian has much the same quality of mind as the Attic Greek. . . . He loves to be where he can display his quickness of intellect before his fellows, a prey to mordant vanity and incurable superficialism, persevering only in talk."

In spite of the poetry that throws a halo round the Bedawin, at close quarters the Arab is a poor creature, and the desert air has failed to improve his intelligence. His sight is inferior, he is dull of hearing, he is a bad shot, bad rider, bad fighter, bad breeder, and when brought out of his steppes, as bad a cultivator as a citizen.

The great drawback to the perusal of this book is that in spite of the large number of maps and diagrams there is none that gives all the places mentioned in the text. To be understood, the book has to be read with an atlas on the table or on one's knee. If the atlas is large and in two volumes, both are needed. And although much of the first part is taken up with descriptive orography, there is only one vertical section in the whole volume. We believe it would have been better if four or five larger maps, on which every name mentioned in the text was marked, had been given, instead of the numerous small ones *à la Reclus*, some of which might easily be dispensed with for all the use they subserve. In addition to the larger maps, a number of vertical sections, running east and west as well as north and south, through such mountainous regions as Albania, Greece, and Asia Minor, would have given greater reality and clearness to the chapters that treat on Reliefs, and would have impressed them more strongly on the memory.

Japan, Our New Ally. By Alfred Stead. With a Preface by Marquis Ito, G.C.B., etc. London: Fisher Unwin, 1902. Pp. xi + 250.

This is a briskly written book from which in half an hour a reader may gain a fairly accurate idea of the development of Japan from a secluded nation with its own Oriental civilisation to the position it now holds as an intelligent race that has assimilated the material features of our Western civilisation, and has won recognition as one of the Great Powers of the East.

Most of the important aspects of the national life are touched upon—religion, education, commerce, industries, finance, army, navy, police, and so on. It is impossible, of course, within the limits of the book to discuss any of these at all fully. Thus no one reading the brief account of the history of Japanese finance during the last twenty years could form any true conception of the ingenious way in which paper money was issued so as to unify the nominal gold standard within the country and the practical silver standard for outside commerce. A whole chapter is devoted to giving a biography of Marquis Ito, the leading man of Japan; and this and the following chapter on some other leading men are of more than usual interest. The book finishes with the inevitable discussion of the political situation. There is very little geography in the book, and that only incidentally. Artistic Japan is not included; and with the exception of one chapter on the Feeling of the Nation, curiously interpolated between Industry and Patents, there is no attempt at describing Japanese customs or habits of thought. Mr. Stead has, however, effected his purpose of making accessible to the English reader a

brief and accurate account of those aspects of the Japanese life which are of special interest to us under the conditions of the recent treaty.

East of the Barrier, or Side Lights on the Manchuria Mission. By the Rev. J. Miller Graham, Missionary of the United Free Church of Scotland, Moukden, Manchuria. Edinburgh: Oliphant, Anderson, and Ferrier, 1902.

This short and well-written book is a notable contribution to Anthropo-Geography and Christian missionary literature. Mr. Miller Graham is experienced enough as a worker in North China to be master of his subject; he is young enough to present it in modern fashion and vivid style. A map of the three provinces—Teng Tien in the south, Kirin in the centre, and Heilung-chiang in the north, and thirteen photo-illustrations—complete a delightful book full of new facts and cautious conclusions political and social. "East of the Barrier" or the Great Wall is the Chinese name for Manchuria, and more specially its southern province. We owe the opening up and the rapid Christian progress of the people before the Boxer rising to Scotsmen, notably to William C. Burns, who died in Newchang, its port, in 1868, and to Dr. John Ross, who arrived there in 1872, and still works as hard as ever. Allied with the United Free Church Mission is that of the Irish Presbyterian Church, whose representative, Dr. Gregg, at Kirin, should be named with these two. But, indeed, few missions have been so successful, thanks not only to those but to physicians like Drs. Westwater and Christie, and to men like James Webster and the author of this book. The political questions raised by Russia and the Anglo-Japanese alliance are wisely treated.

Afoot through the Kashmir Valleys. By Marion Doughty. London: Sands and Co., 1902. *Price 7s. 6d.*

The beauties and the glories of the Vale of Kashmir have been celebrated by poet and traveller from time immemorial, so much so that the subject might be considered threadbare and stale, but Miss Doughty, the writer of the volume now before us, proves that it is not so. Although she disclaims being a poet or artist, her descriptions in this work rise far above the level of an ordinary itinerary in an interesting country. It is very clear that she has a keen and sympathetic eye for the grandeur and beauties of nature, be they the eternal snow-clad mountains like the giant Nanga Parbat, or the modest, tender floweret which clings to the side of a precipice. She has also the generous enthusiasm so appropriate to the magnificent scenery she describes, and a kindly, winning sympathy and consideration for the people among whom she travelled, which deservedly stood her in good stead on various occasions. She has a grand fund of self-reliance and strong English courage, and apparently a splendid physique, because of which no prognostications of evil or danger daunted her, and even unfortunate accidents which would have upset an ordinary traveller's plans were made of little account. Her literary merit is as remarkable as her power of observation. Reading this book, those who have already seen Kashmir will be delighted to refresh their memories in such delightful company, and those who have never seen Kashmir will regret the fact still more and more. The work is abundantly illustrated with beautiful photographs.

AFRICA.

Mission Scientifique Du Ka-Tanga. By Capitaine Charles Lemaire.

This is one of the publications of the Congo Free State, and gives in seventeen *mémoires* the results of observations made during a scientific expedition through

the southern parts of the Congo Free State from 4th August 1898 to 2nd September 1900. The results comprise accurate measurements of the latitudes and longitudes of several hundred stations, of the magnetic elements, and of the altitudes determined by barometric and hypsometric measurements afterwards reduced. The expedition began their journey at Moliro on Lake Tanganyika, struck westwards to Lake Moero, and gradually westwards and somewhat southwards as far as Lake Di-Lolo in latitude 11° 30′ 3·08″ S., and longitude 22° 2′ 39·74″ W. of Greenwich. Returning by a more southern route roughly parallel to the first, the expedition reached Lake Moero again, and then passed on nearly northwards until Tanganyika was struck a second time, in latitude 6° 44′ 14·77″ S. After skirting along the west shore of Tanganyika as far as M'Towa in latitude 5° 42′ 59·29″ S., they then moved NW. and N. in a single line of stations to Stanleyville on the right bank of the Congo. Thence they proceeded by rapid stages to Leopoldville. The barometric observations, on which the determinations of height mainly depend, were made with great care, the expedition being supplied not only with the ordinary aneroids but with a mercurial barometer of Captain George's construction, which seems to have given entire satisfaction. The hypsometric determinations of the pressure agreed remarkably well with the indications of the mercurial barometer; and under the steady climatic conditions characteristic of Central Africa, the calculation of the heights corresponding to the observed pressures may be depended upon to within a few metres. The height of the level of Lake Tanganyika is given as 795 metres, and that of Lake Moero as 950 metres. So far as regards the magnetic observations, the measurements of the horizontal intensity depended on oscillations only of certain needles, and cannot be trusted beyond the third significant figure. The equipments of an absolute magnetometer would not have added very much to the weight; and it seems a pity that an expedition so well equipped with other instruments of precision should have been contented with a merely *relative* magnetometer. Speaking from experience, we know that the necessary observations for the absolute determination of the earth's magnetic force can be carried through within the hour once the chronometers' time rates are known. The method adopted in these *mémoires* of giving the time of oscillation to six or seven significant figures, whereas no single observation can be sure of the fourth figure, is open to criticism. The most important practical magnetic element is however the declination; and in the measurement of this quantity the degree of accuracy attainable is much higher. A comparison of the values of the declination obtained at different times at the same place leads to an estimate of the secular variation, which agrees well with what would be expected. The data form an important addition to our knowledge of the magnetic condition of the earth, and will no doubt be given full weight in subsequent discussions of the facts and theories of terrestrial magnetism. The *mémoires* are accompanied by maps showing the itineraries. The rivers crossed and the heights reached are shown in full detail. It would have added to the interest if some slight indication had been given of the lie of the isogonal lines.

The Gold Coast Guide. By Rev. J. B. Anaman. London: *Christian Herald* Office, 1902. *Price* 5*s.*

We have received a copy of the second edition of this useful little work. The contents comprise brief accounts of the geography and history of the region, as well as a large amount of information in regard to political, educational, and other conditions.

African Wastes Reclaimed: Illustrated in the Story of the Lovedale Mission. By Robert Young, F.R.S.G.S. With numerous Illustrations. London: J. M. Dent and Co., 1902.

This is in no sense a scientific book; there is not even a map among its many interesting illustrations. But it is a popular and valuable contribution to the history of civilisation in South Africa since the year 1824, when three Scotsmen from Glasgow—Thomson, Ross, and Binnie—formed the first mission presbytery. From that has sprung, with much else, Lovedale Institution, which the *Cape Argus* correctly describes as "the pride of South Africa." Mr. R. Young does justice to the early pioneers, and especially to Dr. James Stewart, who, more than any one man, has since 1867 made Lovedale what it is.

AMERICA.

Descriptive Geographies from Original Sources—North America. Selected by F. D. Herbertson and edited by A. J. Herbertson, Lecturer in Regional Geography in the University of Oxford. Pp. 252. London: Adam and Charles Black, 1901. *Price 2s. 6d.*

The idea of this Series is an excellent one, and marks a decided step forward in the teaching of geography. Dry compilations of facts are here superseded by vivid realistic sketches. The countries of the world, their scenery and life, are here described in the language of the men who have seen them. The selection of extracts shows much critical appreciation on the part of the editors, who have drawn from the best standard books of travel and articles in the various geographical magazines. The bibliography for farther reference, and the illustrations, which are only too few, add to the completeness and interest of the volumes.

AUSTRALASIA.

Eine Australien- und Südseefahrt. Von Dr. Albert Daiber. Leipzig: B. G. Teubner, 1902. Pp. 320.

In the year 1900 Dr. Daiber made a tour to Australia and the German possessions in Melanesia. He spent a couple of months in Sydney, whence he made an excursion to the Blue Mountains and the Jenolan Caves, and saw as much as was possible of Perth and Fremantle, Adelaide and Brisbane, in the short time the steamer stayed at the ports. On the voyage to Hong Kong he had opportunities of visiting Herbertshöhe, Astrolabe Bay, and Ponape. In these pages he narrates his experiences, adding some chapters on the history of Australia, its trade, commerce, etc. His descriptions are readable, though they naturally do not contain anything that is not well known. Apparently he is unacquainted with the cable system of haulage, for he speaks of "elektrische Trams (Kabel)." The book is well got up, and furnished with good illustrations.

James Chalmers of New Guinea: Missionary, Pioneer, Martyr. By Cuthbert Lennox. Second Edition. London: Andrew Melrose, MCMII. Pp. 208.

By the death of James Chalmers, Scotia lost one of her most heroic sons. Born at Ardrishaig in 1841, he was sent by the Church Missionary Society in 1866 to Karotonga, one of the Hervey Islands group, where he remained for

ten years. In 1877 he went to New Guinea, where he lived continuously, with the exception of two vacations in Great Britain, till his death in 1901. When he first landed little was known of the native tribes that peopled the south-eastern portion of the island. The only white people in the country were Mr. and Mrs. Lawes, who had settled at Port Moresby in 1874. Before ending his useful and energetic career as a preacher of peace, he knew the whole coast from South Cape to the Fly River, and had made a number of expeditions into the interior. He was exactly the man for the work he had to perform. Of fine physique, large-minded, unconventional, of a frank and open nature, he impressed the natives, who easily became his friends. His courage and endurance were often put to the greatest test, but never failed. He was one of the few men who make the least of difficulties, and his commanding personality often inspired his timid native followers with a courage that was not theirs. Though his efforts to stamp out cannibalism were most successful, he was attacked and killed by cannibals on the Aird River, and thus he ended a life that will never be forgotten in the history of British New Guinea.

Pioneering in New Guinea. By JAMES CHALMERS. With seven illustrations. London: The Religious Tract Society. N.D. Pp. 312.

This volume seems to be made up of extracts from the author's journal, apparently after his death. He expresses his opinion, seemingly quite in earnest, that it is a great mistake to send out short men as missionaries or teachers to savages like those of New Guinea. They ought to be selected for their height, as a giant imposes upon the savage mind and is at once respected. No doubt there is truth in this observation, for if Bismarck and Rhodes had been of a less colossal build, they would probably have less impressed the popular imagination in Europe. Chalmers was not without his humour. At one village he taught the native children to repeat their A B C to the tune of "Auld Lang Syne." Then he goes on to say, "All tried to join, and it was like a thunderstorm between two hills." At another village the boys when being taught the Lord's Prayer found it so humorous they were convulsed with laughter, though eventually they learned to repeat it in a decent manner daily. Chalmers's labours as a missionary seem to have been very successful, for though some of his friends with whom he was much in contact never cared anything about the Gospel and took no interest in it, this was not the case generally. What the natives seem most to have appreciated was the era of peace that followed in the train of the new teaching and the cessation of internecine wars.

Interspersed here and there are a few items of interest to the ethnologist. Pottery, as among many other savages, is solely manufactured by women, and salt water only is used to moisten the clay. Every woman has a private mark which is put on everything she makes. Dog-flesh is a common article of food. The Koitapuans are much feared by neighbouring tribes, as they are believed to have power over rain and the monsoons. The natives are very revengeful, and require blood for blood. Hence, when there is a war between two tribes, each tries to exterminate the other by killing all the women and children, so as to lessen the chance of revengeful reprisals at a future date. For the use of travellers the author gives a list of signs by which it may be known whether a native is friendly disposed or means mischief when he encounters another man. At the end of the volume there are 115 answers given to questions of ethnological interest respecting the two tribes of the Motu and the Motumotu.

GENERAL.

L'epoca delle Grandi Scoperte geografiche. Di Carlo Errera. Con 21 carte, schizzi e ritratti. Milano: Ulrico Hoepli, 1902. Pp. 432. *Price, lire* 6.50.

This is a well-written sketch of the evolution of geographical discovery from the fall of the Roman Empire to the first circumnavigation of the globe. It is the record of the golden age of geography, when its knights' errant went forth into the mysterious unknown. The names of Marco Polo, Bartholomew Diaz, Columbus, Vasco da Gama, Magellan, and Cortez inspire the imagination, they are universal heroes in the world's history, and their travels furnish the romance of geography. Professor Errera has done his work most carefully, and the value of his little book is much enhanced by numerous references, reproductions of original maps, and a complete index.

Grammatical Fundamentals of the Innuit Language as spoken by the Eskimo of the Western Coast of Alaska. By the Rev. Francis Barnum, S.J., of Georgetown University, Washington, D.C. Ginn and Company, Boston, U.S.A., and London, 1901. Pp. xxv + 384. *Price* £1 *net.*

The materials for this work were collected by the author while he was engaged in mission work on the coast of Alaska. With most praiseworthy patience he inquired of the natives the names of different objects, and wrote down Eskimo stories from their dictation, and investigated each new difficulty that presented itself until he had acquired a thorough knowledge of the Innuit language. His grammar is, we believe, the first published in the English language that has any claim to completeness. It was compiled solely for the use of the Innuit missions, but the author has yielded to the desire of his friends that it should be published. Philologists will welcome the book as a new contribution to their science, and students of the Eskimo language will find it a great assistance, though it might be considerably improved in form and simplified. The author admits that it has deficiencies, but he lacked the time to reduce it to proper shape.

It is to be regretted that the English vowel-sounds have been used, and some changes in the consonants might be recommended; but these are details of minor importance. The language being agglutinative, the roots and suffixes should have been made the base of the whole system, and then there would be no need for separate chapters on suffixes and verbal modes. Among the modes we find the termination *ngnughrag'yuqtoa*, signifying the desire to obtain a new object. Now, *nugkak* signifies new, and *uq* desire, while *toa* is simply the personal ending, and these, having been already explained, need not be repeated. A serious omission is the rules for euphonic changes, without which the student is unable to build up words for himself. Thus, *nugkak* here becomes *ngnughrag'*, and *uq* is preceded by *y* (in some words by *ch*, as in *nechuqtoa* and *yakfalirqchuqtoa*). Philologists would, of course, like to know something of the origins of these roots, but such information cannot be expected in a grammar. The Rev. F. Barnum has given us much and may yet give us more.

The Holy City, Athens, and Egypt, founded on Personal Observation and the Researches of Modern Explorers. By Sir Wm. T. Charley, Kt., K.C., D.C.L. London: Marshall Brothers, 1902. Pp. 446. *Price* 10*s.* 6*d.*

This somewhat curious book is the result of the system of "Educational Travel" established by Dr. Lunn and Mr. Peronne, Sir Wm. Charley having in January and February 1899 sailed in their ship with nearly two hundred companions, and

visited Jerusalem, Athens, Egypt, and other places. The book takes the shape of a story based upon the actual knowledge he thus acquired by sea and land, and he certainly made wonderfully good use of his opportunities, and gives an interesting and instructive account of the localities visited. Excellent illustrations embellish the narrative, during which, in a chapter on "The Higher Critics of the Impregnable Rock of Holy Scripture," the author cross-examines modern critics with the acuteness of a lawyer well fortified with authorities.

A Text-Book of Commercial Geography. By Cyrus C. Adams. With Maps and Illustrations. Pp. 505. New York: D. Appleton and Company, 1901. *Price 5s.*

We have recently had many attempts at a systematic Commercial Geography, but this work of Mr. Adams is the only one which shows a decided advance on all previous works. The subject of economic geography, the distribution of natural products and the conditions of their supply and demand, is such a vast and complicated one, and of such importance, that its adequate treatment would really require a series of handbooks with an atlas of special maps. But as this is an educational text-book, the treatment is necessarily limited and general. The introductory chapters on the general conditions affecting commerce are particularly interesting and suggestive. The rest of the book is arranged geographically, the physical features of each country are considered as affecting its industries and commerce, the various articles of the trade of the country are then dealt with and discussed. It is evident that the work is the result of much research and careful discrimination, and Mr. Adams deserves credit for a most valuable contribution to the study of commercial geography. The numerous sketch-maps, diagrams, and illustrations are exceptionally good.

A Commercial Geography of Foreign Nations. By F. C. Boon. Pp. 174. (Methuen's Commercial Series.) London: Methuen and Co., 1901. *Price 2s.*

This book only deals with the nations of the world outside the British possessions, but as it is a companion volume to Mr. Lyde's well-known *Commercial Geography of the British Empire*, the two together form a complete Commercial Geography of the World. Mr. Boon appears to have a good general grasp of his subject, his descriptions are terse, but he is always careful to emphasise the correlation of cause and effect. The trade of each country and the principles determining the distribution of the chief products are clearly stated, so far as the limited space of an elementary text-book will permit.

BOOKS RECEIVED.

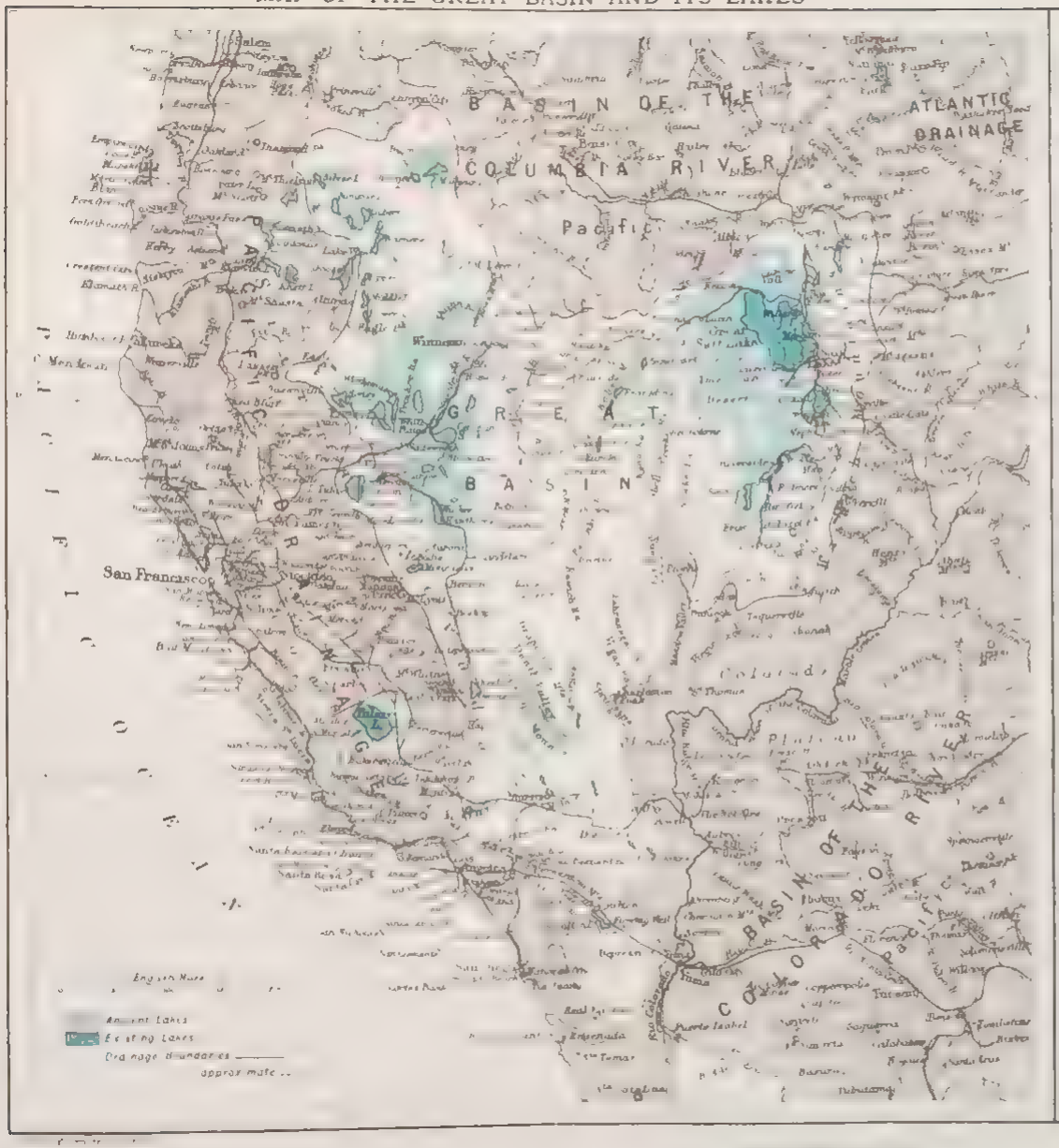
The Uganda Protectorate. By Sir Harry Johnston. London: Hutchinson and Co., 1902. Two vols. Imp. 8vo. Pp. xx + 470 and 562. *Price 42s.*

North Wales. Part I. By M. J. B. Baddeley and C. S. Ward. "Thorough Guide" Series. London: Dulau and Co., 1902. Pp. xxiv + 238. *Price 3s.*

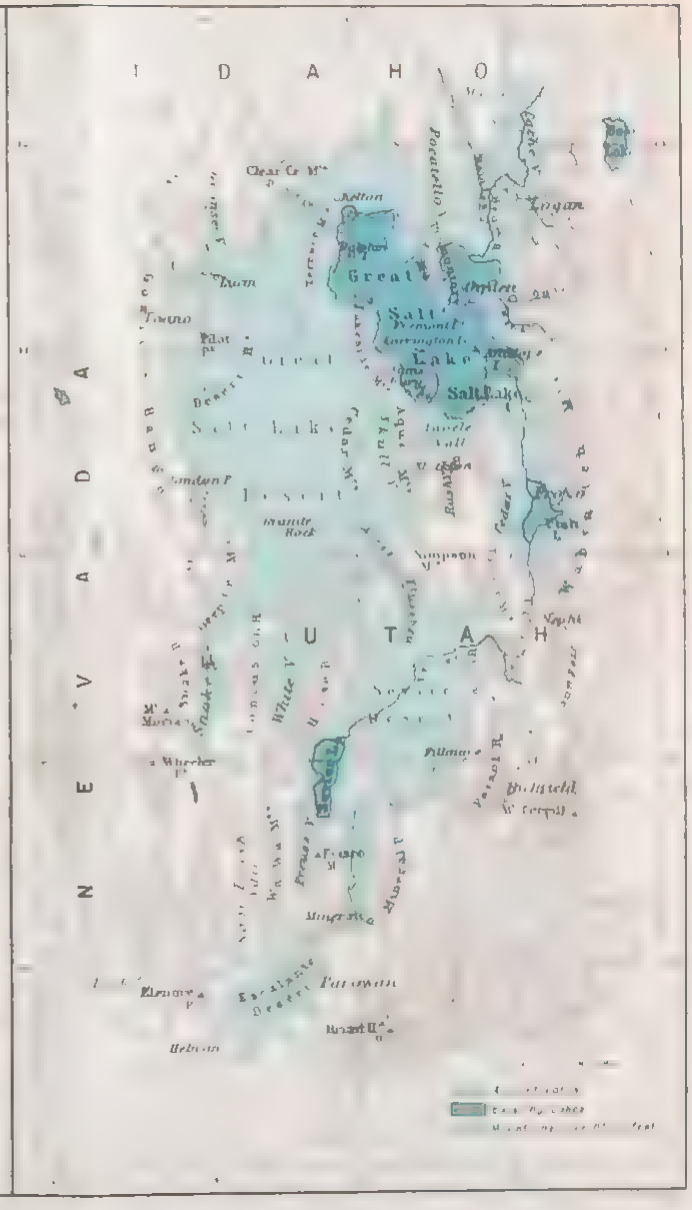
The Story of Prague. By Count Lutzow. London: J. M. Dent and Co., 1902. Pp. xix + 212. *Price 3s. 6d.*

A Rambler's Notebook at the English Lakes. By the Rev. H. D. Rawnsley. Glasgow: Maclehose and Sons, 1902. Cr. 8vo. Pp. viii + 258. *Price 5s.*

MAP OF THE GREAT BASIN AND ITS LAKES



MAP OF LAKE BONNEVILLE



THE SCOTTISH GEOGRAPHICAL MAGAZINE.

THE PROGRESS OF GEOGRAPHICAL KNOWLEDGE.[1]

By Colonel Sir T. H. Holdich, C.B., K.C.I.E., F.R.G.S.

With so large a field as that which is embraced by geography before us, I feel a little doubtful which way to turn in order to gather into one short space both the scattered records of recent geographical history and to present to you at the same time illustrations of some fixed principle which in the course of the development of our geographical knowledge must govern the progress of it. Last year you heard from Dr. Mill a most excellent summary of the present phase of that development in this country. You heard not only of great activity in the wide world of the unexplored and unknown, but of new efforts to train up a fresh generation of explorers; of new schools springing up amongst us; fresh evidence of the faith that is in us that geographical knowledge points the road to commercial success; happy intimations of the existence of a yet higher faith—the faith which believes that scientific knowledge of the world's physiology is worth the getting for its own sake, whether it paves the way to golden success or not. And now, whilst recalling the chief geographical events of the year that has passed; whilst counting the landmarks on the road to a higher geographical education, I would also claim your attention for a brief space to a few technical problems which beset the business aspect of future procedure, and which so long as we make it our boast that we belong to the biggest empire in the world ought most certainly to attract our earnest attention.

The unknown world is growing daily smaller. It is, indeed, narrowing its area with a rapidity which is absolutely regrettable. If you think of those delightful days when the men who went "down to the sea in ships" brought gold and ivory to the steps of Solomon's Temple,

[1] The Presidential Address delivered before Section E (Geography) at the British Association at Belfast.

believing that beyond their nautical ken all the rest of the world was but flat emptiness: or even centuries later when Marco Polo's truthful tales of Asia were discredited as wild fables; or again in almost modern times when Vasco da Gama bent his knees in pious prayer ere starting on the buccaneering venture which was to change the destinies of the East, you will find it almost impossible to look at the well-turned-out maps of to-day, wondering where next it may be possible to strike a new feature or unfold a new vista to geographical enterprise, without something like a sigh. But it is with the world as we find it mapped to-day that we have now to do, searching out the position of such blank spaces as still exist, and considering the best means of dealing with the vast area of its half-exploited surface so as to obtain the best results for the time and labour spent on completing our knowledge of it.

Antarctic Prospects.

To the Polar regions we naturally turn first, for they form the special domain of modern initial exploration. We are very far yet from having elucidated the great geographical problems of sea and land distribution which lie hidden under the depths of palæocrystal ice. We only know indeed from inference that at one end of the world there exists an unmapped sea, and at the other an unmapped continent, round the edges of which we are even now feeling our way. When the *Discovery* left Port Lyttelton, New Zealand, on December 24 last for the South Polar regions, this was the quest which, in the modest language of her originator, Sir Clements Markham, lay before her: "To determine as far as possible the nature and extent of the South Polar lands" and to "conduct a magnetic survey." If we look at the unexplored area of these South Polar lands as a whole and examine the plan of international geographical campaign which has now been directed against them, we shall find, I think, that the present enterprise is by far the most complete and systematic, as it is the most scientific, that has yet been undertaken in the Far South. It is impossible but that great results should be attained from so complete an investment of the unknown continent.

With the *Discovery's* investigations, which will be directed to Victoria Land—the land of the historic volcanoes Erebus and Terror—from the side of Tasmania and New Zealand, will be associated at least three other expeditions, all aiming at a final solution of the South Pole problem. From South America Otto Nordenskiöld's expedition has taken the shortest sea-route past the South Shetlands to Graham's Land, and has already passed a winter amidst the ice. From South America, again, the Scottish expedition under Bruce will work its way past the Sandwich Islands, skirting the Antarctic Circle, some fifty degrees to the east of Nordenskiöld, almost on the Greenwich meridian, and as nearly opposite as possible to the *Discovery's* attack from the other side of the Pole; whilst between the two will be the German expedition of the *Gauss*, pushing southward about the meridian of 90° E., a worthy rival in scientific equipment to our own ship the *Discovery*. And there is no branch of scientific inquiry which will be advanced by this international

attack on the great unknown southern land of more interest than that which pertains to the history of the world's geography. Independently of securing a firmer outline to the vague definition of southern land areas of the present day, it is there that we hope to find evidences of another distribution of those areas in primeval times. Shall we be able to trace the Patagonian formations, those recent basaltic lavas which overlie trees, beyond that point in Graham's Land where we know that they occur again, to the Australian side of the Southern Pole? Shall we find that Erebus and Terror are but the natural extension of that magnificent array of volcanic cones which overlook the Pacific from the Patagonian Andes? Will the Miolania, the great turtle of Patagonia—not unknown in Australia—complete with his bones another link in that chain of many evidences that Patagonia and Australia once met across the extreme south? You may say this is not geography. I hardly know whether in these days it is still necessary to plead that between geography and natural sciences, whether of geology, biology, or anthropology, the connection is so intimate that in the actual field of research it is impossible to disconnect them. Modern geography is but a development, and whilst the process of its evolution is perhaps to be found in strictly geological fields, it has so modified and influenced the problems of life and the distribution of it throughout the world, that a collector of facts like myself finds it convenient to accept, for the mere sake of simplicity, the science of geography as the best basis for divergent inquiries into many other scientific fields, which can be differentiated at leisure by the natural philosopher.

Necessity for Study of Geographical History.

But whilst we are justified in expecting much from this great international movement, we must still moderate our expectations. We must admit that in the field of purely naval exploration we have not the same developments in mechanical and instrumental accessories which place within our reach the possibility of conducting land expeditions on far more scientific and exact methods than were possible to our grandfathers. Wireless telegraphy, for instance, will not yet enable a ship fast bound in Arctic ice to determine her longitude, and the restless ocean still precludes the use of many of the more finely graduated instruments which are essential to the exact measurements pertaining to triangulation. Methods and instruments, indeed, will not differ materially from those adopted by Franklin or by Ross more than half a century ago. Better instruments of their class no doubt are within reach, owing to the extraordinary accuracy of modern production; but better hands to hold them it would be impossible to find. We are often so pleased with ourselves in these days that we are apt to forget what has been done by our geographical forerunners in the same field as ourselves. I have but lately returned from a journey full of geographical interest which has carried me over some of the tracks left many years ago by a British scientific expedition to the South Seas, which will be ever associated in the memory of all geographers with the names of Charles Darwin and

H.M.S. *Beagle*. With the wider scope for gathering information which is afforded in these days by the growth of civilisation and the shooting out of its long tendrils into the waste places of Patagonia, it has been possible to verify some of the suggestions as to the structure and geographical configuration of that southern continent which were offered by the observations of Darwin, and to examine here and there, in some detail, the results of recent local surveys in testing the accuracy of the coast outline and of the coast soundings established by the *Beagle*. Of the former I can only say that they seem to me prophetic; of the latter, so little change has taken place in South American coast configuration during the last fifty years that practically the charts of the *Beagle* are the charts of the Chilian and Argentine Admiralties of to-day, with hardly a noticeable variation. Such magnificent results as were achieved then are hard to beat at any time. We do not hope to beat them. We can only hope to imitate them. They stand good for all time, and it is useful to recall them now and then in order to emphasise a truism which is occasionally overlooked by modern geographical explorers. It is not the most recent work in the field of exploration which is necessarily the most valuable. One of the great sins of omission in modern exploration is that of a failure to appreciate the efforts of preceding geographers in the same field of research as ourselves—the want of a patient absorption of all available previous knowledge before we attempt to add to the sum of it. We are not all of us gifted with the patient determination of that great traveller Sven Hedin, who spent three years in reading about Central Asia before he wrote a word on the subject. It cannot be too strongly urged in these days of narrowing fields for activity that although geographical research is essentially an active function of an active life, it demands yet more and more, as time goes on, the application of the scholar added to the determined energy of the explorer.

Contraction of the World's 'Terra Incognita.'

It is, however, when we leave the high seas with their almost inexhaustible store of unexplored ocean floors and ice-bound coast-line, and turn from oceanography to the more familiar aspects of land geography that we find those spaces within which 'pioneer' exploration can be usefully carried to be so rapidly contracting year by year as to force upon our intention the necessity for adapting our methods for a progressive system of world-wide map-making, not only to the requirements of abstract science, but to the utilitarian demands of commercial and political enterprise.

Asia.

Take Asia, for example: nearly half of the great continent pertains to Siberia, and within the limits of Russian territory the admirable organisation of her own system of geographical exploration leaves no room for outsiders to assist usefully, even if political objections did not exist. In Central and Southern Arabia there is undoubtedly still much to learn, but of the remaining countries which intervene between the

Mediterranean and India, of Persia, Afghanistan, and Baluchistan, it can only be said that the work of the geographical pioneer has already ended where that of the engineer and surveyor has commenced. In the Furthest East again—in Manchuria, China, Tonkin, and Siam—there is much more room for the practical exploration of the road and railway maker than there is for the irresponsible career of the geographical traveller. The highway from China to India is almost as well known as that from London to India, and the activity of railway enterprise in the south of Asia bids fair to rival the triumphs of Siberia. It is only in the central deserts of Mongolia and the wastes of Tibet spreading southwards to the Himalayas that we can find untrodden areas of any great magnitude, and even in Central Asia before venturing on a statement of future possibilities in the field of exploration, it would be well to wait for the records of that most intrepid traveller, Sven Hedin, who promises us material of scientific and historical interest as the result of his last three years' travel, far in excess of the monumental contributions which he has already made public. Historically, the interest of the world of inquiry in Asia, where we find the origin of the great races of the world and the birthplace of all religions, must always be immense; but that history can only be elucidated by a clear illustration of the great highways of the Continent which were open to the vast migratory movements of mankind in prehistoric periods. We do not in the least understand the condition of climate, nor are we quite certain even of the relative distribution of land and water in High Asia in the days when its swarming population first began to flow south and west, carrying the elements of a language which we have been accustomed to regard as primeval into the swamps and plains which lay beyond the Himalayas or the Caspian. It is only through geographical research that some dim outline of those early stories can be realised; and although the researches of Stein and the marvellous discoveries of Sven Hedin around the ancient lake district of Lob Nor will, after all, only throw the world's history back for a few centuries, it is by means of these first steps backward that we can feel our way to an appreciation of the earlier processes of this phase of human evolution. Nor in the interests of utilitarian commercial speculation is geographical research in Asia yet to be set aside. We indeed know comparatively nothing of its resources in mineral wealth. It is quite within the bounds of possibility that one of the great central treasure-houses of nature lies enveloped in the geological axis of the highest mountains of the world, and that we may yet be enabled to explain why every river which flows from Tibet washes down gold in its bed. But this will only be when the Tibetan Lama is prepared to shake hands with the Uitlander; and I fear that recent South African history will not encourage the embrace. Meanwhile there is no more promising field still open to the *bonâ fide* explorer than that of Tibet and the farthest ranges of the Himalayas. Few people are aware how vast an extent of the Himalayan area still remains untrodden by any European. This is due to no want of enterprise on the part of our Indian surveyors and political officials. It is due partly to physical inaccessibility, and partly to that intense (and easily understood) objection to the inter-

ference of the stranger in which many of our trans-frontier neighbours permit themselves to indulge. Nevertheless would I commend to those who still desire to walk in the rough and thorny path of pioneer geographical discovery a similar enterprise to that of our aforetime secretary, Mr. Douglas Freshfield, who lately succeeded in passing beyond the bounds of official exploration into the Eastern Himalayas. We have had many travellers in the Himalayas, but they have not always distinguished between the fascinating pleasures of romantic adventure and the earnest pursuit of geographical business.

Study of Glaciers.

To Mr. Freshfield we certainly owe an introduction to a new vista of great scientific interest in the study of the formation and movements of glaciers. Here, perhaps, we are treading gently on the skirts of geological science; but I have never yet found that part of the world where the careful study of local geographical conformation will not inevitably invoke an inquiry into geological construction. We must accept the inevitable criticism and go on with our glaciers. Where in the world can there be such an area for research into the conditions of glacial formations as is presented by the Himalayas? I grant the physical and political difficulties in the way to which I have referred, but still well within the limits of our own red border there are glaciers yet to be studied, which if not the largest, are yet large enough to satisfy the loftiest aspirations, and beyond that border the difficulties of approach are lessening day by day, and are no longer so formidable that they need hinder the steps of any determined explorer.

South American Glaciers.

The speculative interest in glacial movements and their influence on the geographical conformation become far greater when one moves in a country which has been recently shaped and polished, grooved and fashioned, by glacial action; when huge blocks of granite or porphyry, standing sentinel over terraces and ancient glacier-beds, witness to the passing of icebergs in prehistoric seas. Such conditions one may find in two widely separated areas—viz., in the Pamirs and in Patagonia. What causes led to the formation of the first vast ice-cap of which the glacier is the latest evidence? what caused its disappearance, its reappearance? why are the glaciers again withdrawing from the mountains? and what causes the universal process of modern desiccation, of which there is such ample evidence in the Pamirs, in Baluchistan, in Patagonia? It is to the Himalayas that we turn first for an answer to this question; but there are other fields almost equally promising, and one of them is to be found in South America. No one now can pretend any longer that we know nothing of Patagonia. Probably no country in the world has been described by so many geographers in so many different ways: there, at any rate, is a land of glaciers and snowfields awaiting research which presents few of the physical difficulties of the Himalayas. Here is

a wonderful country truly, where glaciers reach down to the sea in low latitudes, casting little icebergs into waters fringed by green banks of fuchsia and myrtle, and of bamboo; where the laurel grows into magnificent timber, competing with the Patagonian beech for root-hold on the moss-covered soil. The round grey heads of the granite hills, scratched and seamed by a discarded ice-cap on one side of the narrow straits, balance the snow-bound peaks of the Cordilleras on the other. No physical difficulties bar the way to the investigation of glacial phenomena amidst some of the most striking coast scenery in the world. Near the parallel of 51° S. are two Patagonian lakes closely associated—Argentina and Viedma—which offer opportunities for the study of glaciers such as are probably not to be found anywhere else in the same latitude. For here the phenomenon of disappearance is in the stage of natural illustration. Glaciers are disappearing rapidly which but a few years ago seemed to be a permanent feature of the surrounding mountains, and the lake surface is chequered with their débris. There, too, may be studied for hundreds of miles northward the natural sequences of their disappearance—the formation of freshwater lakes and their gradual desiccation in turn—whilst all around there is the continued story of geographical evolution due to the alternate forces of glacial and volcanic action written in gigantic characters on the face of nature.

Central South America.

Not very much has been added of late years to our practical knowledge of the hidden depths of Central South America, except from the inexhaustible mine of information possessed by that eminent geographer, Colonel Church. A Brazilian expedition in 1890; the explorations of a commission sent to investigate the interior with a view to the establishment of a new political capital to Brazil in 1892-93; the discoveries of Dr. Ramon Paz in 1894, and a chequered journey in the Valley of the Orinoco by Stanley Paterson in 1897, form the principal records of modern days. There is doubtless much which is of the greatest commercial and political interest still to unravel in connection with the geography of the great river basins of the continent. But in South America we are threatened with perhaps the greatest development of what I may call artificial geography that the world has ever seen. Not only will the consummation of the Panama Canal project change the whole system of our western sea communications, and probably exercise a more enduring effect on the world's commerce than even the Suez connection between East and West, but the possibilities of linking up by a central canal system the three great river basins of the south—that of the Orinoco, the Amazon, and the Plata—is under serious consideration, and the mere project will in itself lead to an exhaustive examination of much untravelled country. Thus, even South America no longer offers a large field for the geographical pioneer of the future. With its narrowing areas of *terra incognita* and its almost phenomenal advance towards a leading position as the pastoral and meat-producing quarter of the habitable globe; with possibilities of development in this particular line

probably exceeding those of Australia, New Zealand, and South Africa all put together, it is surely high time that South America turned her attention towards a combined and sustained international effort to place her scattered and most insufficient geographical surveys on a sound geodetic basis extending through the whole continent.

North America.

In the geographical fields presented by North America, as also by Australia, magnificent as are the opportunities for acquiring that personal acquaintance with the great depositions of nature, which environ new conditions of life, and shape the course of human existence to its appointed ends, or, in other words, to acquire a geographical education from original sources of instruction, there is but little opening for the enterprise of the pioneer who aspires to show the way into new fields. There is no lack of native enterprise in colonies peopled by the stout-hearted descendants of generations of explorers. Neither Canadians nor Australians wait for England to show them how to develop the resources of their own country, or pilot the road to new ventures. On the contrary, we have to turn to Canada now for instruction in the higher art of geographical map-making, and to admit that England has been left far behind in the development of the special branch of science which deals with the illustration of the main features of geographical configuration in relation to their geological construction.

Africa.

In Africa the advance of our knowledge of the main outline of the geographical features of the continent has been so rapid since the days when the Nile was first traced to its source by Speke that a perfect network of explorers' lines of travel now embraces the continent in its meshes, and it is only in the intermediate spaces that room for enterprise on the part of the pioneer is left, even if it may not be said altogether to have vanished. A reference to the little map published by Mr. Ravenstein in the *Geographical Journal* for last December will show you at once that the hydrography of Africa has been fairly well traced out in all its main arteries, leaving but few unexplored spaces of any great extent; and that such spaces, where they occur within the area which is especially open to Englishmen, demand an organised system of exploration more complete in its results, more carefully balanced in its relation to the geographical illustration of those lands which are beginning to form centres of civilisation than can be secured by the process of pioneer route-making. In short, we want a system of geographical surveying allied to those systems which have been perfected after years of careful experiment by Canada, or Russia, or France, or by England in India. This, however, brings us into a field of technical inquiry of great importance, into which, so far as it deals with geography, *i.e.* with the measurement of the earth's surface and the illustration of its configuration by means of maps, I propose to enter briefly in this Address.

Modern Requirements in Geographical Map-making.

You will agree with me that geography in the abstract, without illustration—the geography which used to be taught by geography books without maps—is but a poor and inefficient branch of academic knowledge, hardly worthy even of an infant school. It does not matter what branch of this comprehensive science you approach, whether it is historical, or physical, or political, modern or ancient, the only substantial presentment of the subject to man's understanding is that which has recourse to map illustration. Words (especially words bearing such indefinite applications as our modern geographical terminology) can never convey to the imagination the same substantial illustration as maps convey to the eye. You may think that all this is mere truism; so it may be; but I assure you that what I may call descriptive geography, that is to say, geography without the aid of maps, has more than once nearly precipitated national disaster in quite modern times—disaster quite as perilous as any which in military fields has been caused by blank, wholesale ignorance of the features of a country in which strategic movements are undertaken. There comes a time in the history of every developing country when the increase of its people, and the consequent distribution of land, demands surveys for the purposes of fiscal administration. Consequently such surveys are common everywhere; and from these have been built up, piece by piece, like a child's puzzle, the geographical maps of many half-occupied lands, illustrating only such portions as are adaptable to economic development, and leaving blank all that promised to be unproductive and unprofitable.

Field of Geodesy.

It was only when it was discovered that the sum total of such a production was apt to cause great confusion in land assessment, inasmuch as it often did not equal the actual area of the land distributed, that there arose a school of mathematicians who concerned themselves with determining the dimensions and figure of the earth, and founded that apparently complicated system of primary map-making which now takes count of such matters as the curvature of the earth's surface, the convergency of meridians, and other spheroidal problems which affect the construction of the map. Thus arose "geodesy," and geodesy has numbered amongst its apostles many of the greatest mathematicians of the age. Geodesy, the science which deals with exact measurements, was never an embodiment of abstract mathematical investigation. It had always a utilitarian side to it, and it is unfortunate that this view of the science has been occasionally lost sight of in late years. For we have not done with geodetic investigation yet. Magnificent as are the results obtained by the mathematicians of the past, there are still further refinements to be introduced into those factors which we daily use for the reduction of our terrestrial observations ere we obtain perfect mathematical exactness (if we ever attain it) in our results: and we still must look to the processes of geodesy to give us that backbone, that main axis of indisputable

values from which our network of triangulations may spread during the first steps in geographical map-making. To a certain extent geodesy is the support of technical geography, and a short inquiry into its present conditions of existence may not be out of place.

It is to North America that we must now turn for instruction in the latest development of the science, and to South Africa that we must look for its future application. Russia has not lost sight of the necessity imposed on her for an extension of her magnificent European geodetic system through the vast breadth of her Asiatic possessions, but we ourselves in India are concerned nowadays rather with scientific observations on collateral lines, and with the collating and perfecting of the results attained by the great achievements of past years, than with any developments in fresh fields of geodetic triangulation. Germany and France, ever alert where colonial interests are concerned, are busy in Africa, but I am not prepared to say how far their geographical efforts are based on the strict principles of geodesy.

In North America, along the meridian of 98° through Texas, Kansas, and Nebraska, geodetic triangulation still forms one of the most prominent schemes of modern work undertaken by the Coast and Geodetic Survey; and in South Africa there is growing northward into the Transvaal, slowly, but we hope surely, the framework of a gigantic arc which one day will be extended by Sir David Gill from the Cape to Cairo.

I am anxious to impress on you that the science of geodesy is not a science of the past. It is still active, and with all its refinements of minute accuracy and exact precision in observation and in calculation, it should be the initial mainstay, and it must be the final court of appeal, as it were, for all those less rigorously conducted surveys of the reconnaissance and exploration class which we term geographical.

But this accurate framework, this rigorously exact line of precise values which ultimately becomes the backbone of an otherwise invertebrate survey anatomy, is painfully slow in its progress, and it is usually haunted by the bogey of finance. It does not appeal to the imagination like an Antarctic expedition, although it may lead to far more solid results, and it generally has to sue *in forma pauperis* to Government for its support.

Geographical Surveys.

And thus it happens that long before the tedious and expensive processes which are involved in the term geodetic triangulation can possibly be carried to an effective end, the cry goes up for a geographical survey. It is wanted by the administrator to whom it is all important that he should know the roads and river communications, and the productive areas of the land he has to administer, and be able to locate the various tribal sections or peoples with whom he has to deal. In the political department a geographical map may be said to be absolutely necessary for the political purpose of defining limits and boundaries. It has been, I am aware, occasionally dispensed with, but never with satisfactory

results. To the officer on whom rests the responsibility of preserving peace and good order it is most desirable that the military features should be fairly represented in such a manner that at least a general plan of action can be arranged at short notice. For the economic development of the country it cannot be too strongly urged that a general geographical outline of its surface is indispensable to the selection of lines for special technical examination, whether for roads, railways, canals, or telegraphs. How often lately in the history of our colonial or frontier progress have vast sums been expended on special lines of railway in ignorance of the fact that better alignments of infinitely less physical difficulty would have been at once revealed by a general geographical map even on the smallest scale? In short, the cheapest, the quickest, the surest, indeed the only satisfactory method of regulating the progression of public works, the development of commerce, the proper recognition of the frontier boundaries, the administration of justice, and the military control of a large and growing colony, or of a long stretch of military frontier, is to be armed with a perfect summary of what that country contains in the shape of a geographical map; and yet it is only quite lately that this fact has been recognised by English administrators and English generals in their dealings with new colonies and new frontiers. Russia learned the lesson a generation ago at least. When she reached out a hand for Constantinople, her army was accompanied across the Balkans by whole companies of surveyors, who worked on no sketchy system of indicating lines of route here and there. They pushed at least seven series of triangulation across the mountains, and on that as a basis they mapped the whole country in detail on a good military scale (about an inch per mile) right up to the very gates of the Turkish capital. For years her brigade of topographers have been busy along her Afghan and Siberian frontiers. In Persia, Baluchistan, the Pamirs, and China, wherever, in fact, there may be in the future some prospective view of a closer political, commercial, or military interest than exists at present, there they are to be found. France has always been strong in the geographical field, and the late achievements of Frenchmen in the world of exploration and of exploratory map-making are only equalled by the scientific knowledge and literary ability displayed in their technical literature on the subject. Colonel Laussedat's contribution to the *History of Topography* is to be reckoned with as a standard work. In Canada and North America we have perhaps a practical exposition of the art of geographical surveying which is as unequalled in completeness and comprehensiveness as the country with which it has to deal is unequalled as a subject for its application. There the close association between geological structure and geographical conformation is so fully recognised that the same technical process of surveying is applied for the purpose of the double illustration. The Canadian geological survey is their geographical survey, and I think that it is to Canada (if not to India) that we owe the first recognition of the fact that geographical surveying is a separate, distinct, and most important branch of the general art, which should form the basis—the mother survey as it were—from which all other surveys should spring. In India, I am happy to

think that this advance in the science of geography is now well understood. It has been more or less forced on us by the necessity for such rapid and comprehensive surveys as are required for frontier military operations, for the purposes of boundary demarcation, and for the important duty of keeping our own trans-frontier information up to the level of that of our neighbours. In our African colonies it has, alas! been discovered a little too late that geographical surveys are a sound preliminary to military operations, but the discovery once made it is not likely to be overlooked. Here, indeed, was presented a most forcible illustration of the danger of building up a geographical puzzle-map; of piling one on to another the results of local fiscal surveys, in the hope that when they were all put together they might make a good topographical guide to the country. Needless to say, the result was disastrous from the scientific point of view, and it might almost be said of it that it was disastrous from the military point of view as well. Imagine for an instant that the Canadian system of a geological survey (involving, of course, accurate topography) had been applied *ab initio* to South Africa, who can possibly say what the result might not have been by this time? The expansion of the Rand mines, for example, depends at present on local experiment carried out, no doubt, by most able engineers with all the knowledge of scientific mining that is to be acquired in these days of advanced specialism. But all the same I may be permitted to suggest that their experimental ventures, their tentative borings, are subject to a good deal that is almost guesswork for their application, and that a comprehensive, carefully conducted geological survey of the whole country would probably have afforded valuable indications in many unexpected directions. So also as regards schemes for local irrigation. Take the north-western part of Cape Colony, for instance, the district known as the Karoo, where the best military map existing at the time of the war did not even pretend to show the main roads through the country. The stage of development at which that part of the colony has arrived in the all-important matter of local irrigation is only worthy of the Dark Ages. It would be laughed at in Persia or Afghanistan. The Arabs of mediæval times were experts in the art of the conservancy and distribution of water in dry lands, compared to the modern South African (or South American) farmer. Now, I do not say that schemes for merely local irrigation require geographical maps to support them. Such schemes only require a little enterprise, a little common sense, and a little capital, but I do say that the geographical map would long ago have revealed the opportunity for comprehensive schemes, such as exist in India, just as it would have pointed out the best alignment for roads and railways, the best means for dealing with an enemy who can move fifty miles in a night, and who can make, not merely a few square miles, but a whole district the theatre of his operations. What was wanted (and is still wanted) in South Africa, is what is wanted in every part of the continent subject to British suzerainty. I know that I am but echoing the urgent demand which has been made by every commissioner and governor within the limits of that vast area—not for elaborate or special maps for fiscal and revenue purposes, all of which will come in due time—but for

scientific geography which shall now take the place of the preliminary work of pioneer explorers and deal with the country as a whole, instead of tracing it in outlines and in disjointed parts. In short, they require all gaps filled up. They want to know what the country contains in the way of forests, of open land suitable for agriculture, of desert and swamp, of opportunities for roads and railways, for telegraphs and irrigation, before deciding on the right position for the centre of an arterial system of public works which shall pervade in natural and orderly sequence, and, in due time, every part of the body of the country of their administration. Now, this is scientific geography. It is not ordnance map-making, nor anything very much like it. It is a comparatively new demand on the scientific resources of England, and those resources are by no means equal to the demand. Before considering resources, however, we must look to the scientific means to this geographical end. I have already referred briefly to the subject of geodesy, and I have told you that what is termed geodetic triangulation is a function of high scientific order, demanding not only minute and painstaking care on the part of an able staff of observers, but very considerable time and very considerable expense to carry it to a satisfactory issue. I have also pointed out that inasmuch as the exact distribution into parts of any large space of the world's area must ultimately depend on the exact measurements which are a function of only the highest class of geodetic triangulation, we must look finally to geodesy to support the framework of our geography, and to give it its rightful place in the great total of the world's mapping. But the demand for geographical mapping is not satisfied with the promise of an elaborate basis for the work which has first to be constructed with the expenditure of much time and money before anything in the nature of a final map can be produced for purposes of administration. The political world, too, cannot always sit patiently through all the international disagreements, the losses, the unrest, and the positive national danger to which an unsettled boundary gives rise, whilst the geodesist works slowly through the country year after year, piling up sheaves of equations and folios of observations, but never a square mile of practical topography. As for the military department I hardly know what to say. There is the example before us of Germans, Russians, French, and Americans, all conducting their campaigns with maps in their hands, taking every special means at their command in order to acquire such maps before they commence operations; whilst the Boers have fought us to the bitter end with a practical knowledge of the country which is even better than maps, and which is exactly that class of knowledge which maps are supposed to replace or supplement. None of them wait for geodesy.

Certainly the attitude of the military department is not one of neutrality. They would like the maps, they are even anxious to get them, but they are not quite certain that they are worth paying for. However that may be, I can only express my own conviction that geographical mapping will be found to be an urgent necessity in every corner of the unmapped world subject to British influence. We would like to wait for those accurate determinations of geodesy which would at

once furnish us with the best of all possible means for commencing a comprehensive geographical survey. But we cannot afford to wait, and the great geographical problem of the age is how to reverse the natural sequence of scientific procedure and to obtain maps of the unmapped world which no subsequent geodetic operations shall condemn as inaccurate. It is not a question of expediency; it has been one of necessity for many years past; and inasmuch as necessity is the mother of invention, I think that it will finally be conceded that means *have* been found for ensuring sufficient accuracy in geographical work to render it capable of enduring the subsequent tests of completed geodetic measurement without dislocation and without interference with the general utility of the maps, even if that accuracy be not scientifically perfect.

It is not my intention to bore you with technical details. I only wish to impress upon you that in the field of scientific geography, as in other fields, "the old order changeth." We must work on new principles in order to meet new demands.

Use of the Telegraph in Geography.

One of the chief means to this end is the telegraph. Few people appreciate the important *rôle* which is played by the telegraph in these days in the field of geography. It was not so very long ago that the first step towards regenerating a natural wilderness, or for securing access to new commercial openings or centres of uncivilised population was held to be the construction of roads and railways. Means of physical access was the first step towards the development of a country which was regarded as unenlightened from the standpoint of European civilisation. It is so no longer, for the telegraph often threads its way through many a dreary waste of unpeopled earth, uncoiling its length for hundreds of miles in advance of any railway, or indeed of any road, which can in the ordinary sense of the term be described as a constructed road. I will give you an illustration. On the Patagonian pampas not so very long ago, in the midst of a wide wilderness of snow, after losing our way in a blinding snowstorm and camping on our tracks for the night, we struck the end of the telegraph line which is now being pushed across Patagonia, and which will eventually connect the Atlantic with the Pacific. We had seen no roads whatever for a great part of the distance we had traversed. Our daily procedure was the simple process of following a guide over the illimitable stretches of bush-covered uplands which reach down from the eastern foot of the Andes in gentle grades to the Atlantic shore; and when we did at last fall in with the great central line of trans-continental communication we found it to consist of the wheel-marks of certain previous wagons which had drifted along that way, a sort of road which it was exceedingly easy to lose in the fading light of a stormy winter's day. On this road there was nothing but a telegraph end and the tents of a few telegraph officials, and we were some 150 miles from our destination on the Atlantic coast. And so it happened that after weeks of absence from any means of

communication with the outside world we were thus suddenly put in possession of its very latest news; and the very first message that passed from the end of that line into my hands was the message of peace with South Africa, signed an hour or two previously. I accepted that message as a happy omen for the result of our Patagonian mission. And thenceforward (thanks to the courtesy of the telegraph chief at Buenos Aires) nightly as we sat in the snow we read all that was important from the London evening papers of that self-same day. We were not starving by any means, but had we wanted a loaf of bread in that unbroken stretch of snow-covered bushland we certainly could not have got it; whilst here was information flowing in with a daily ease and regularity that I greatly missed when once again I was within reach of clubs and civilisation. The importance of telegraphs in the field of geography, however, is not confined to the transfer of news to casual travellers. It is the facility which it places in the hands of the geographer for determining his position in longitude that renders it so important a factor in the prosecution of a geographical survey. Every one knows that the first duty of a geographer is to discover his latitude and his longitude. Hitherto the determination of the first has been a matter of no great uncertainty, but, as regards the latter, one can only say that the confidence expressed by most explorers in the results of their observations has never been justified by the final verdict of subsequent determination. It is, in truth, most difficult even for the most practised observer to obtain an absolute value in longitude on which he can rely within such limits of accuracy as are essential to the construction of a map where these values have to be employed differentially. The telegraph places in our hands the means of differential determinations within a degree of exactness that surpasses even that of the most careful determination of latitude; and the telegraph is everywhere. Supplementary to the facilities of time-signalling by telegraph is the wonderful accuracy of graduation introduced into the smaller classes of new instruments which in these days replace the cumbersome equipment of the past. With a small 6-inch theodolite fitted with a complete vertical circle time values can be determined within a fraction of a second, and latitude values to within two seconds of arc, always provided that that great bugbear of the astronomical geographer, level deflection, does not interfere with his results. But the same minute accuracy in graduation which has so improved the ordinary little instruments which you find in the hands of the professional geographer has, when combined with new methods for accurate linear measurement, also placed it in his power to carry out a fairly coherent and systematic triangulation with great rapidity and accuracy over large areas of country whenever the configuration and characteristics of that country are favourable. Usually they are favourable. Large expanses of flat desert, of undulating veldt, or of unbroken forest are the exception, not the rule, and they must of course be dealt with as their special peculiarities demand: and for the normal conditions of land configuration, given that the explorer is specially careful about his base measurements and his initial data, he can certainly, with modern instruments and the facilities for check given him by the tele-

graph, carry on a rapid and comprehensive geographical survey which will fulfil all the conditions required by the administrator, economist, political geographer, or military commander within such limits of accuracy as will ensure its standing all the subsequent tests that geodesy may apply without any apparent map dislocation. And practically that is all that is wanted for a first map. I have used the word "rapidly." Few people (even scientific geographers) have really grasped the full meaning of the term as applied to surveys on geographical scales (*i.e.*, 1 : 250,000, or about four miles to the inch, or less) under normal conditions. Such surveys can be completed quite as fast as an army can advance in the field, even granting that the advance is continuous. They can even to a certain extent precede that advance in face of an enemy. A single triangulator, with a staff of two or three topographers in a fairly favourable country, will be responsible for an out-turn which may be counted by hundreds of square miles per day. The records of both American and Canadian surveys will prove that the marvellous progress made in the frontier reconnaissance surveys of India is nothing abnormal or unexpected.

Necessity for Training Schools.

So far I have spoken about the system only, a system which has been nearly perfected by experiments in Canada, Russia, India, and elsewhere. Now we have to turn from the work to the workmen. It is only lately, quite lately, that England has discovered that such workmen are wanted at all. Five or six years ago there was not a topographer nor a topographical school in England. But the demand during late years has been insistent and constant, with the result, I am glad to say, that efforts have been made in various directions to start topographical schools, and a distinct change is apparent in our methods of instruction at military headquarters. No purely technical central civil schools such as exist on the continent are to be found in England, and the natural result is that at present England possesses no finished topographers, and not many men who know what is meant by a geographical survey. In the wilds of Patagonia (which is, I must premise, a country beset with special climatic difficulties, but not otherwise one unsuitable to the topographer's art) I met many men of great intelligence and exceptional skill who had been gathered from various quarters for the purpose of topography. There were Italians, Argentines, Germans, French, and Swiss, but not an Englishman amongst them. Russians, of the type of my old and unforgotten friend Benderski, have long been famous for their skill; but although English administrators and soldiers are alike crying out for more and better assistance in the active field of topography, they cannot get it from England. The establishment of a school of practical geography such as must eventually guarantee the existence of a military topographical corps would be a matter of congratulation deserving to be noted as an important step in the advance of the geographical education of the country, no less than the school at Oxford, which deals more directly with civil interests, and is rightly most concerned with the

academic aspects of geographical instruction. Even this, however, is hardly sufficient. I am convinced that the recommendation which arose from certain resolutions formed in the Geographical Section of the British Association Meeting at Bradford two years ago in favour of the employment of natives in Africa for African work, just as Indian natives are employed in India, is thoroughly sound. We want schools in Africa as well as in England. Only in this way will the vast areas still unmapped in our African protectorates be dealt with at reasonable cost and in a reasonable space of time.

Photo-Topography.

Certain developments in the practical field of geography have lately been brought to the test of continued experimental application, and the progress of these experiments deserves a passing record. Notably the application of photography to purposes of geographical illustration has received immense impetus from the apparent facility with which the experimental media can be handled. In favour of the haphazard landscape illustrations with which we are usually deluged by travellers there is little to be said. They are far more frequently illustrations of the personal progress of the author than of the general character of the country he progressed through. Neither is there much more to commend in photographs designed to reproduce geological or tectonic features, glacial configuration, special orographical conditions, or the like, unless the position of them and the direction of the line of sight from the point of view are very clearly indicated on a corresponding map. At the best they are apt to be deceptive, for the reason that they can but deal with one side of a subject and with only a partial view of the particular feature they represent. Every one knows that an apparent range, or even a system of ranges, of mountains may be nothing but the *revêtement* of a high plateau or tableland; but the photograph of such a mountain system will give no indication of the plateau beyond the range which can indeed only be determined by a survey and properly illustrated by a map. I need hardly say that a topographical delineation of ground derived from observations made by the aid of photography demands as much technical skill on the part of the topographer and as much systematic application of the use of instruments as any other survey. It must be a combination of careful triangulation and skilful plane-tabling precisely as is the product of a topographical survey. It demands, if anything, more special training and a more elaborate method of procedure than does ordinary survey. So far as the results of experiments made over suitable fields in Canada can teach us, the verdict is in favour of the process only under certain conditions of light and climate when it is desirable to obtain a record of observations in as short a space of time as possible, either in high altitudes, when psssing clouds afford but a fleeting view of the landscape, or in low-lying districts, where active tribal hostility in the field or some similar condition renders it desirable to curtail operations as much as possible. Under all other ordinary conditions it is maintained by Canadian surveyors that

although both time and labour may be saved on the field operations, the resulting map can never attain the same standard of accuracy in detail that distinguishes good topographical illustration of the usual variety of natural features. I am, of course, now speaking of geographical surveying as an art, not of mere geographical exploitation. In the latter case doubtless every traveller who can "pull the string" in these days can add immensely to the personal interest of his journeys by his illustrations of them. But I would earnestly impress upon all travellers that if they desire those illustrations to be of any use for geographical compilation, it is absolutely necessary to know the point from which they were taken and the direction of the view.

Barometric Records.

Once again, too, would I warn travellers of the utter uncertainty of all classes of barometric determinations for altitude. Very little has been done in recent years towards improving instruments of the barometric class, and meteorological science has not yet taught us how to deal with the constant variations in air pressure produced over local areas by changeable weather. There are some countries where barometric records can hardly be regarded as offering a clue even to differential heights. It cannot be too often insisted on that the determination of the relative heights of mountain peaks and of the local value of refraction by means of the theodolite is as much the duty of the triangulator as is the fixing of those peaks in position for the use of the topographer. From these again the altitude of positions in the plains can be safely determined by small instruments of the clinometer class without resorting to the barometer at all, although it may still be necessary to ascertain the value of one initial (or final) point which must be determined by many observations spread over a considerable length of time and synchronous with another set of observations determined at sea, or some already known, level. This, of course, will occur only when a new geographical area is opened up to survey at some distance from the sea.

Universal Mapping.

It will be remembered that a scheme was set afloat some years ago by Dr. Penck, the eminent German geographer, for the mapping of the whole world on the scale of one-millionth, which is very nearly equivalent to the scale of sixteen miles to one inch. Substantial progress has now been made in support of this scheme by English map-makers, especially in India, where all the trans-border countries which have fallen geographically into the hands of Indian surveyors are now being mapped on this scale. In the commencement of all great colonial survey schemes it is much to be hoped that this project for one homogeneous and universal map will not be lost sight of.

Map Spelling.

I wish that we were as well on the way towards homogeneity in spelling as we are in scale; but it is much to be feared that arbitrary

rules will have to be applied to so many special localities that no universal system is ever likely to be adopted. The further that exact geography extends, the more difficult becomes this problem, until at last we shall probably arrive at the conclusions adopted long ago by the Government of India, and consider it best to lay down by order an arbitrary list of prominent names, and rule that the spelling of them shall be maintained as in this list in all Government records and maps. Scientists may disagree, but after all it seems the only practical way out of the confusion that exists at present.

Terminology.

There is yet another subject of world-wide interest to the geographical student equally with the practical geographer which requires something of the erudition of the philological scholar to be brought to bear upon it in order to arrive at a satisfactory issue. I refer to the subject of geographical terminology. It may seem an easy thing to be satisfied with such general definitions as are involved in the terms "range of mountains," "coast lines," "main channels," "watersheds," "slopes," "affluents," and the like; but when these terms, and terms similar to them, are employed in international agreements and treaties, carrying with them the necessity for identifying on the face of nature the feature which corresponds to the term employed, there is always to be found room for discussion as to what its exact meaning may be. For the variations of nature are infinite, and no two features classified under the same generic name are alike. Were I to give you examples of only a few of the geographical expressions which, carelessly used, have led up to serious international disagreements, you would, I am assured, agree with me that it is high time that geographers all the world over came to some definite understanding about the meaning of geographical terms. To take an instance. What is a "range" or a "main range" of mountains? Where does it begin? Where does it end? How far does the term involve geological structure? When a continuous line of similar structure is split across the axis of it, does it become two ranges or does it remain one and the same range? Or, again, what is "the foot of the hills"? Is it where the steep slopes end and the talus or gentle gradients of its detritus commence, or must you follow the latter down to the nearest watercourse? If you talk of the coast-line of Western Patagonia or of Norway, do you include such headlands as are connected with the mainland at low water, and exclude the islands, or do you mean the coast line of both? What is the main channel of a river? Is it where the flowing water scours deepest from time to time, or is it a fixture amongst a score of minor channels that shift and change? Perfect definition is, of course, hopeless. It is not in the power of man to deal with all the infinite variations of geographical feature and to classify them as he would specimens of botanical origin or of natural history. But we might arrive at a much more satisfactory dictionary of geographical terms in our own language than at present exists, and we might offer that dictionary to the geographers of the world at large

and say, "Here we have at least endeavoured to explain our meaning when we make use of geographical expressions. This is what is taught in our schools as the best means of translating the general idea into a distinct mental conception of natural features; and in future when we use these terms you will know on the best authority that England can produce what it is that we mean by them." Then possibly instead of having to turn to Germany and France for assistance in expressing ourselves clearly when drawing up legal documents dealing with geographical conditions, we may find the English language become the standard for this special class of literature in spite of its verbal poverty. This, at any rate, is what is now being attempted by the Geographical Society, which spares no effort in order to obtain the best literary assistance in its compilation that the country affords. We shall soon have a geographical dictionary, I trust, and be able to enter with a little more ease and confidence into the field of literary discussion of geographical subjects.

Progress of Geographical Education.

The progress of geographical education in the country, although it is by no means so universally apparent as might be considered desirable, yet shows encouraging symptoms of vitality in many directions.

The Civil School at Oxford, for instance, conducted by Mr. Mackinder, has already made most successful efforts to produce expert teachers of geography. Here, in addition to 208 students, of whom 163 were men, attending courses during the past year, five students have already won the Post-graduate Diploma granted by the University, and it is encouraging to note that four out of the five have already obtained distinctively geographical work. Others similarly qualified, if of sufficient ability, would probably not have long to wait for opportunities. In addition to its regular university functions, the Oxford school has this year organised a summer course of three weeks' study. This has been well attended by teachers and instructors from all parts of the country, and even from America.

In London a department of economic geography is in course of organisation at the School of Economics and Political Science, and geography will become a compulsory subject in examinations. In the matter of examinations we have to chronicle the issue of a most excellent syllabus for the new London Matriculation which should ultimately have great influence on the teaching in many schools.

Further, the "Geographical Association," a body now of several hundred teachers, has made great progress. It has recently commenced the issue of a journal known as the *Geographical Teacher*, one of whose functions appears to be the criticism of the questions set in various public examinations.

Satisfactory progress has also to be recorded of the School of Surveying initiated by the Royal Geographical Society, now under Mr. Reeves. The diploma has been awarded to a number of candidates (about twenty-five) who have passed through the school, who have

invariably found suitable employment as surveyors subsequently. Indeed the demand for trained R.G.S. surveyors already exceeds the supply, although it cannot as yet be maintained that our means of training are as perfect as we could wish.

In military schools the report of the late committee appointed to consider the education of army officers shows clearly enough that amongst all the necessary subjects for a cadet's education which have to be crammed into the exceedingly short course of his military schooling, that branch of geography which is embraced by the term "military topography" finds a very conspicuous place. The short course of a military school will never turn out an accomplished geographical surveyor; nor does it in any way outflank the necessity for a military school for professional topographers. But it teaches the young officer how maps are made, and instructs him in the use of topographical symbols. It would be well if it could be pushed a little further—if it could teach him how to make use of the maps when they *are* made—for personal experience convinces me that the apathy shown by many of our foremost generals and leaders on the subject of maps arises chiefly from a well-founded doubt of their own ability to make use of them. As for the broader basis of general geographical instruction which would deal with the distribution of important military posts and strategic positions throughout the Empire, and teach officers the functions of such positions, either individually or in combination, during military or naval operations, it is perhaps better that such a strategic aspect of geography should be relegated to a later age, when the average intelligence of the cadet has become more fully developed.

Taking it for all in all, there are distinct signs of a more general interest and more scholarly standard of thought in the subject of geography. This is probably due to the efforts of a comparatively small group of workers at a time of general educational reform, possibly partly stimulated by the disclosures in connection with the late war.

The methods of further improvement are simple—better teachers and better examining—and for both it is probable that we must look more directly to civil sources than to the tentative efforts of the military schools.

NATURE STUDY AND GEOGRAPHICAL EDUCATION.

By Professor PATRICK GEDDES.

THE "Plea for a National Institute of Geography," set forth by Mr. Bartholomew in the March Number of this Magazine, and accompanied by a "Plan and Note" by the present writer, has briefly outlined the needs and possibilities of a comprehensive geographic institution upon the museum scale. Such a museum was shown to be twofold; on the one hand comprehensively scientific, on the other directly practical. On one side it offers a synthetic presentment of the stellar and planetary

universe, and of our globe in relief, with due developments of detail, cartographic, descriptive, etc. On the other hand the practical usefulness of such an institution, industrial, commercial, colonial, etc., was briefly indicated, and this latter aspect of the proposed institution may be more fully realised by help of Mr. Branford's description of the Philadelphia Commercial Museum in the May Number.

Leaving for a time the comprehensive treatment of the science—that impartial survey of all countries which is the keynote of most geographical treatises, large and small, from Reclus's *Géographie Universelle* through Mill's *International Geography* to the school text-book—we may take up the standpoint of our own immediate region, and use this as the centre around which to group our ideas. This has been briefly attempted in the writer's paper on "Edinburgh and its Region, Geographic and Historical," in the June Number, and also—quite independently, but by a happy coincidence—in the more purely physical Survey of Edinburgh in Mr. Richardson's paper on "The Physiography of Edinburgh," in this Magazine for July.

The preceding group of papers are thus complementary, one pair emphasising the cosmic, and another the regional standpoint, one more purely scientific, the other more directly practical. Outlines though they necessarily are, they broadly map out the two hemispheres of thought, speculative and practical, the two poles of thought, the cosmic and the regional.

Yet, apart from the obvious possibilities of following the points of view above outlined into further and further detail, there remains a large and a practical inquiry—that of correlating such a comprehensive survey of geographical thought, and of the corresponding possibilities of action with the work of education.

How are we to put the vast ambitions of geographical education, not only of presenting a geographical synthesis, but the corresponding geotechnic synergy, into relation with the actual work of school and university, with the requirements of the technical colleges, with the urgent problems of industrial and commercial life? How are we to organise geographical education? At least, how may we begin it aright?

Thus stated, the theme is obviously a well-worn one. The claims of each special science to its place in education, the claims of technical and commercial instruction, the value of geography, each has had its case ably and fully stated once and again.

Yet despite much progress, too many of the best general ideas, from Mr. Spencer's *Education* onwards, too many of the best teaching methods in geography, from Dr. Keltie's *Report on Geographical Education* onwards, still remain mere "counsels of perfection," which the teaching world has not yet seen its way adequately to utilise. Why is this?

May it not be partly at least because the advocates of science have not succeeded in fully adapting their studies to the growing mind, in helping the teacher to grade their sciences according to age and powers into the regular work of school and college? And further, may it not also be because their advocacy has been too much the advocacy of

"Natural Science," and too little an opening of the classroom into Nature itself, a leading out of the pupil into direct and first-hand acquaintance with her varied and living reality?

Hence the importance of the present movement in British as in foreign education towards Nature Study. Improved school buildings and hygiene, games and gymnastics, have each fought and won their struggle for recognition. The chemical laboratory, and more recently the physical one, is now a recognised necessity of every secondary school. The workshop and the cooking-room are now similarly incorporated in every school-plan. More recently still, the school museum and the swimming-bath in their turn are passing through the same stages of development; first "fad," then luxury, then convenience, and finally necessity. What remains to be asked for?

Facilities for nature study, school excursions and school journeys, school gardens, and the rest—these are now in the first rank of immediate educational desiderata.[1] Following upon the example and stimulus of American[1] and French education, upon the experience of Summer Schools and scattered individual teaching-initiatives nearer home, the Scotch Code has not only recognised but insisted on instruction in nature study since 1899, and has been promptly followed by the English Code in 1900. Courses of instruction for teachers have sprung up in many parts of the country; and all these many activities have recently found an important expression in the recent Nature Study Exhibition (Royal Botanic Garden, Regent's Park, July 23 to August 5, 1902). Of this some of the best exhibits have more lately been on view at the Cambridge Summer Meeting, and also at Edinburgh. Here then is at once a theoretic and a practical strategic point for the geographical educationist. How best is he to relate his freshened and growing interest in Nature with his demands for a more comprehensive yet also more precise knowledge of the world? And if the present movement seems to him as yet too purely dominated by natural history or sometimes by botany almost alone, may he now show at once how to co-ordinate these with geographical instruction—putting, for instance, the school excursions and journeys upon their cartographic basis, and systematising and interpreting them by help of the master-conceptions of his science, as of latitude and relief, of climate and season. Is it not from some loss of geographical perspective that the nature teachers are at present so insistent upon this and that "method," so intolerant sometimes of each other's? Yet, is it not largely for want of this direct and concrete touch with living nature happily now coming into education that the claims of geography have been as yet so long delayed, and are even now so scantily met?

If this be so, it may be of advantage to make a brief examination of the ways and means of developing the elemental observation of outdoor nature, with which the child naturalist begins, into that larger survey of the cosmos which is the ideal of the geographer.

[1] See the writer's paper, "Facilities for Nature Study," in *Report of Nature Study Exhibition*, London, 1902.

Let us put then these questions to both geographical teacher and nature teacher—the more sharply perhaps the better :—

(1) Has not geographical education as yet failed to win its due place, and must it not go on failing till we base it on nature study?

And conversely, (2) must not nature study in its turn fail, or degenerate into mere specialist collecting, as it has done once and again, unless we develop it into geography?

To begin with, has not the geographer something to learn from the nature teacher? Despite the permanent excellence of the arguments for geographical education, his subject has historically become once and again a pedagogical failure; and despite his recent amendment, and consequent endeavours and opportunities towards obtaining a new footing in school and college, he has not as yet won adequate recognition as a pedagogical success. And so long as a child has more interest in a picture than a map, and in a natural history ramble rather than a surveying excursion, must he not recognise that each is appropriate to its age and stage, and that the former may be the better preparation for the latter, rather than *vice versâ*?

When this is felt by the geographical teacher, he begins anew; and this time neither with the use of the globes nor with the plan of the schoolroom, the map of the playground, and so on, but with a genuine ramble. Without at first obtruding map or even compass, he leads or rather follows his pupils as they wander through wood and brake, and linger by ferny bank and rushy pool. The beauty of the country, the natural interest in strange things and common ones, the questions they raise to the child's own mind, not to the teacher's—here is the true stuff of nature study and of geography alike. Such nature-loving children are already naturalists, and need only a little help to become no less truly geographers.

Naturalists first—not geographers. Their natural concentration upon the beauty and interest of the immediate foreground, which calls them now to right and now to left, now forward, and now back again, at first obscures the sense of direction, of time also. Yet they are all the more fully living in the *here* and in the *now*, and so in this apparently unorganised and irresponsible freedom the educative process is going on. For what more can naturalist or geographer claim to possess than the habit of observing and thinking for himself and at his best, without books or helps, in presence of the facts, and in the open air? Our ideal of training is thus like the appreciative musician's—in full mid-stream of impressions to concentrate and isolate any one sequence or co-existence, yet without losing touch with the whole. Nature is thus the ultimate teacher and examiner no less than examinee.

Is it not primarily for lack of this touch with reality, this habit of open-air thinking, that our natural science teaching, our geographical instruction, still too commonly smells of the lamp, and has as yet such insufficient influence upon education or life, not to speak of character or usefulness?

Our young naturalist at length turns homeward, and now has the

time to think of his collection—that primitive museum, the boy's pocket, which successive excursions differentiates and expands into box and bottle and vasculum, each obviously the beginning of a museum-gallery proper. But the specimens are as yet unarranged and unlabelled? True, yet in the developing history of the individual or the race are not these unsystematised collections an indispensable stage? Do they not represent the treasure-house, which has historically preceded the museum? And if we respect this phase, must we not give time to it? Shall we not defeat our ends by seeking to omit it? Are we not risking that perhaps most fatal of all mistakes in education—that which stunts development by seeking unduly to accelerate it? As a wise educationist has lately said, there is no way of so thoroughly and permanently teaching selfishness as prematurely to inculcate continual altruism. Yet is not the same mistake made every day in the teaching of literature, and perhaps as much with science?

We bring home then not labelled and codified lesson-objects, but spoils, treasures, wonders, beauty-feasts. Here are crystals and ores, leaves and flowers, fruits and seeds, shells and butterflies; one has a beautiful feather to add to his hoard, another is gloating over a silvery stickleback, a crested eft, or half shuddering over a fearsome, great-jawed, murderous larva from the stagnant pond.

While this phase of wonder lasts, the wise teacher will not thrust in information unasked. This is why the true naturalist, the initiative geographer, so commonly looks back with even more gratitude to the simple encouragement, the elemental sympathy, the natural fellowship in admiration of kindly nurse or wise parent, than to the instruction of his later and more learned guides. Manure is excellent—in due time and measure—but for this first reason of excellence alone does not the educationist nowadays too often bury his child-garden under cartloads of the best, gravel his seed-bed with overdressings of the richest coprolite, or macadamise it altogether?

This elemental emotion of wonder will differentiate soon enough: first normally appears admiration, and only second comes curiosity. Must we not therefore fully encourage and develop both?—their common element first of all? Is it not at this critical phase of childhood that we have to prepare alike for the later outlooks of specialism, and for the wide yet deep interests of Humboldt's *Cosmos*, for all the surveys of the artist and of the naturalist, of the physical sciences and of the many-coloured world of men?

Leaving then our pupil's collections to arrange themselves by degrees as they grow—their various "natural sciences" as yet undifferentiated—let us with set purpose remain a little while in the earlier, the more fundamental mood of admiration. The child's freedom in his child-world is his literal paradise; he will have to leave it soon enough; so let the teacher for a time be guardian angel: he will soon enough be offering the fruit of knowledge. Yet in thus postponing analytic instruction in the natural sciences we are giving the lead to the artist, and with him to the geographer; and we may see exactly how.

Returning in the evening satiated with minute foreground observa-

tion, pleasantly weary, the eyes naturally relax with rest: they now as naturally take long focus, as earlier in the day the short. We see the landscape rather than the detail; and the landscape too at its time of utmost beauty, with longer shadows, and in more golden light: it may be in the glory of sunset. Now is the time to rise from nature details to impressions of nature. The flaming sky, the golden river, the dark silhouette of mountain or forest, the evening star, the rising moon, each is deeply printing the young retina, is thrilling and shaping the young brain. Is it not to such evenings, such hours, such impressions of beauty, that the naturalist and explorer look back as much as poet or artist? While this process is going on, the wise teacher will have little to say, will be again a child in nature, learning, rejuvenescing himself.

Thinking all this over afterwards as pedagogue, will he not agree that here is also the beginning of art-appreciation, however long before art-production? Have we not here a vital moment in the formation of taste—and therefore, as Ruskin has so clearly pointed out, not only in the beginning of culture, but in the forming of character itself?

This correlation of nature and art may be carried far. The apprehension of the respective beauties best seized by photograph and by painting, the appreciation of their respective qualities of tone and colour, will soon give him an interest in handling the camera and the pencil for himself, a greater desire to add colour to his sketch. Here then is a main strategic point in the warfare against modern ugliness; one also which reflection will show throws much light on the general failure of that commonplace art-teaching which has been a staple of our schools for fifty years. With this fundamental craving for beauty all the senses are at work: hence the child's desire of seeing and hearing, touching and handling, of smelling, and tasting are all true and healthy hungers, calling for the generous ministry of nature to the growing brain through each and all these sensory gates.

Even at the risk of over-labouring this point, it can be hardly too strongly insisted that nature teaching begins neither with knowledge nor discipline, but through delight; the former is but premature until the latter be assured. As for art and music, so for nature: better no teaching than without "the feeling of the subject." Even the living teacher's mind contains much cold and pickled information, and some decayed, besides much nomenclature not needed by the learner; and to refrain the tongue from these is a first duty; to stimulate the direct personal observation of the pupil the second. The results of this sensory education are as yet too rare, though normal, too common, yet pathological, those of starving or dwarfing it. Too many adults are thus not developed children, but defective, stunted, or degenerate ones; and it is not too much to say that much of the so-called "education" of the past is literally definable as the production of artificial defectives. The university teacher of natural science knows this only too well. His adolescent and grown students, even the best and the most diligent ones, are generally inferior to school children of from ten to twelve or fourteen, alike as regards observation and interest, visual as well as verbal memory, and too often in reasoning and in interpretation also. Scanty and

imperfect as is yet this new nature teaching of the schools, it is already preparing a new and healthier type of university student, at least so far as the sciences of observation are concerned, and probably as regards other studies also. To speak of the deeper psychology of the senses, or of the too frequent revenge of the sensory centres in consequence of the starved senses, would carry us beyond our immediate problem. Suffice it here to note the educational value of sensory refreshment in holiday and vacation, in "change of air" and wider travel, with the corresponding convalescence of the dulled and depressed senses, and the renewed growth of the stunted observing and interpretative powers. Here is a main educational use of geography, which is already giving us the systematic development of the school excursion into the school journey at every progressive centre of education, if not as yet fully among ourselves at least largely in every continental country from Norway to Spain, indeed from Russia to the United States. And independently at many such points we see that more intimate correlation of the teaching of science with that of art for which we have been pleading.

Recent improvements of our methods of teaching drawing incline now to the side of detail, again to that of impressionism. Hence one of our most original teachers, Mr. Wyse of Arbroath, begins his children with the loving iconography of their own treasures, the flower, the shell, the butterfly; another, Professor Jackman of Chicago, insists especially on impressionist studies of the trees of his school's park outlook and their seasonal aspects. Must not the immediate future bring the harmony of both methods? And must we not give more and more place in the teaching of visual as of auditive arts, to the taking in a wealth of impressions of beauty before we expect any production of it? How can we go on expecting to bring much beauty out before we have taken much beauty in? Hence, after the innumerable experiments from well-nigh every adult point of view, towards the better teaching of art and science, which have been in progress in our time, must we not now insist more and more upon this developmental point of view, upon these preliminary phases too much forgotten, too often suppressed, even at best probably too imperfectly recapitulated? In generously ministering to mental growth at this fundamental and formative period, shall we not be laying the best of foundations, be developing the true preparatory school? Is not the naturalist, the geographer, or, for that matter, the person efficient in any field of observation or action, most commonly one who (despite whatever later difficulties) has had a feast of impressions in time, and has come into early, however transient, touch with some mind of kindred tune?

To sum up, then, before observing things so as to obtain orderly knowledge from them, let us develop general interest in them. Before producing the ordered beauty of art must come the seeing of beauty. Fundamental, then, to both alike is the art of seeing.

How is this to be taught? May not the pedagogue develop here a gymnastic for his pupil, and train him more and more to see the continually changing beauty of the world, its perpetual changing interest, its "bright and intricate device of days and seasons."

Hence, then, restraining his informational outpour, moderating his instructional zeal, let him seek how to help the pupil to educate himself. Let him keep his own favourite science on the second plane, his elementary psychology—that science of sciences for the educationist—upon the first.

Of this elementary psychology of observation there are no better statements, first, than Meredith's dictum that "Observation is the most enduring of the pleasures of life," and next than Browning's—

> "We're made so that we love
> First, when we see them painted, things we have passed
> Perhaps a hundred times nor cared to see;
> And so they are better painted—better to us,
> Which is the same thing. Art was given for that."

Though it should really be no more necessary to insist on the importance of landscapes and world-pictures as much as of maps to the geographer, it is desirable to carry this recognition more clearly into educational practice—always bearing in mind that pictures are to be pictures—satisfactory from the artistic point of view as well as the scientific.[1] Alike in the teaching of children, of students, and of teachers, the writer has found it of advantage to conduct an excursion now from the scientific and now from the artistic point of view—this summer, for instance, at the Cambridge Summer Meeting exploring one day with net and bottle and vasculum the wonders of the Fen, and another leaving aside the wealth of minute life, and seeking only for landscape impressions of all kinds, from the simplest meadow scenes, through the unique magnificence of the backs of the colleges, to sundown on the river.

And as the naturalist observer aids his observation with lens and microscope, so the teacher of landscape observation should use the appropriate optical appliances also—not only viewfinder and photographic camera, but those two inestimable instruments which have left their mark so deep in the history of art, the convex mirror and the camera obscura. How these two instruments not only develop and quicken the artistic appreciation of nature, but the appreciation of art also, and this in both its two great lines of development, academic and impressionist, must be left to the teacher himself, and to a separate paper on the Art of Seeing.

We have started, then, with the general enjoyment of nature, and have seen something of how to educate the pupil's powers of observation, alike with the naturalist as with the artist. We must pass beyond mere observation, and watch the intelligence at work, interpreting its observations and questioning nature.

How to guide and encourage these child-questionings, how from observation to develop inference, yet how to discipline clearly in the discrimination of these, the good teacher does not need to be told.

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[1] See Mr. Mortimer Menpes' *World-Pictures*, Mr. Pennell's etchings, and the like, as distinguished from too many so-called pictures for school use.

Many suggestions, however, have been given at the recent Nature Study Exhibition, and will be doubtless brought out in its forthcoming Report, while full accounts alike of American nature study methods as of Philadelphia, Cornell, Chicago, Clark, and of other universities and training colleges, etc., are easily accessible.[1]

Keeping to our essential point, the connection of nature study with geography, let us say a word for the child explorer. For here the geographer will at once sympathetically interpret the psychology of truancy, in terms of his own hunger of nature experience, his instinct of travel, and he readily distinguishes the two main attitudes of mind, artistic and scientific, we have been seeing how to develop—Waterton, or Wilson the ornithologist as typical naturalist-truants, R. L. Stevenson or Walt Whitman as artistic ones, while Thoreau and Jefferies oscillate between both. Darwin, of course, is arch-truant of all. He sees, then, that treatment is not merely or mainly by "truant-schools," but largely another method of producing artificial defectives, but primarily by ample excursions with consequent study of resultant treasure-trove in school. Nor need our geographer venture very far into the psychology of locomotion to discover its intimate relation with the feeling of hope, and the joy of rest also; and so understand more fully the familiar anchor-symbol which so well unites all these connotations.

While the nature teacher and art teacher have been collaborating, and the child collections and nature notebooks,[2] the photographs and sketch-books which have been such encouraging features of the Nature Study Exhibition are all in active progress, the geographical teacher may now at length take up the task. It is for him to encourage his pupils and his colleagues alike to distinguish (so far as circumstances of strength, time, means of locomotion, distance, and expense may allow) the characteristic excursions of the neighbourhood.[3] The fields and river banks, the marshes and moors, the parks and woods, every representative scene, if possible, from sea to hill-top, should be visited, and these in each of all their main seasonal aspects as well as in their characteristic web of life.

Here, then, are the beginnings of the higher, the geographical botanising: no longer the mere collecting or even observing of plants viewed singly, or as species, but as Botanical Survey.

Here, of course, must first of all be noted the admirable botanico-geographical labours initiated by the late and much-lamented Robert Smith, whose work, however, in the able and zealous hands of his brother Dr. W. G. Smith, Mr. Marcel Hardy, and others, is becoming, what its projector hoped, the beginning of a general survey of the British Isles, and that in correlation with the survey of France and other countries.

How such regional botanical survey correlates not only with that of other lands, but with all the other elements of a regional survey of our own is a natural and an obvious step; and this, it may safely be pre-

[1] Wallace, R. Hedger, *Nature Study in the U.S.*, Board of Education Special Reports, vol. x. and Webb, W. M., *Nature Knowledge, its Progress and Interpretation*, Board of Technical and Secondary Education, 1902.

[2] Hodgson, M. L., *Nature Lore and Nature Notebooks*. Ambleside (Middleton), 1902.

[3] Beveridge, H., "School Excursions." *Geographical Teacher*, 1902.

dicted, will be more and more systematically co-ordinated by the generation of nature teachers who are now coming forward, and yet more fully taken up by their pupils now in the schools. The long initial insistence of the present paper upon the elemental stuff of nature observation in childhood has been largely in order to lay a broad and deep foundation for this co-ordination, of minutest monograph yet most generalised impression, which regional survey requires and implies.

Even to enumerate the various elements of regional survey now in progress would require a separate paper; suffice it here merely to point out the use of the immediate regional excursions towards building up ideas of the larger world in its landscape and vegetation, in realising its scenes, even of apparently unfamiliar elements. To the child mewed up in the manufacturing town and under the artificial-defective-making processes still predominant, nature is strange and foreign, if not almost unintelligible. But an outing to the nearest golf links on a windy day, with even miniature sand-dunes here travelling before him, or there held fast by their binding reed, or at least with bunkers blowing out, will open to him not only many a long perspective upon our island shores, but upon many a hundred miles along the coast of Europe, from French Flanders round to the Baltic.

That patch of heathery moorland is the Luneburg Heath, and many another; that wetter patch where willows replace heather is the endless Tundra itself. In this fir-wood we are in Norway; in that park with its oldest deciduous trees we are transported to the lower Alps; that fertile carse with here and there a patch undrained or inundated is the English fen-land, the fertile Netherlands; and so on through the world. Even on a winter's day may we not exchange our snowy north for the tropical palm-house at will?

Our regional survey, then, is not one of maps alone; it is a region relief, a season pageant, a region panorama. In each of these our elemental preparation in artistic and in scientific appreciation are fully required, and should go on developing indefinitely side by side through life and culture.

The rambling and gathering of our child-naturalist with his nature notebook has developed into a regional survey, and this again will readily rise into that universal geography, that ever-extending survey of the regions of the world which is the geographer's ideal. Does it not also aid him towards a completer view of geography itself?

Despite its apparently so comprehensive survey from ocean-depth to mountain-peak, and now well-nigh from pole to pole, has not our science been limited in other ways? As maritime survey it is doubtless becoming peculiarly thorough and exhaustive; with the fisher sounding its shallows and deeps, with the mariner charting them, with the merchant-venturer trying every sea-route. In the exploration of strange lands the hunter as geographer has in our day been foremost, but the miner has assuredly not been far behind. In our familiar atlas we may see how it is the soldier who has surveyed strategic points and frontiers, or within our own region how peasant and squire and lawyer have marked out the

property of the individual, the administrative areas of the state, with all the precision that can be desired. From these occupational activities and their corresponding intellectual outlooks our contemporary geography is essentially derived; but does not the broadening educational movement of the times help us to utilise lines of occupational activity as yet less developed into geography, but which not only geographic teachers but professed geographers may follow up more and more profitably in the opening future?

The importance of coal and ore in modern industrial civilisation has given us our well-advanced geological survey, but our botanical survey is only beginning. We have lately had an admirable atlas of meteorology, but we still lack an atlas of soils. We know the mountains of the world, their snows and glaciers, better than the extent and possibilities of the forests; we know much of coasts and sea-bottoms, yet the geography of fisheries is only beginning. We know the deserts of the world, but as yet we are only beginning to see how much of them may be irrigated, how much planted even as they are; we have surveyed marsh and swamp and lagoon, but have still mostly to guess at their reclaimable area. In a word, we have many atlases of geography, but as yet no atlas of geotechnics. Yet what would be more useful to each city and region? to each nation and empire? to the world as a whole? What more serviceable and stimulating in education? and what therefore more conducive to that advancement and to that support of his science which the geographer has so long been seeking, so rarely finding?

Here again we are at the beginning of a new inquiry. Just as we have endeavoured to follow the development from the child's enjoyment of nature around him to the geographer's maturity in visualising the world, so we should now start afresh with the child in nature, and with his activities in work and play, and trace these up along their various lines of occupational evolution; *i.e.* from the fundamental occupations of hunter and fisher, shepherd and peasant, etc. While fully recognising the educational uses, and the physical and moral value of games and sports, we should recognise their limitations also, both largely through study of the origin of games, of course chiefly occupational. The reaction happily now incipient against the prevalent exaggeration of games and sports (an exaggeration largely connected with deficient nature-experience in teachers and taught) presents no very serious difficulty from this point of view. For as the specialising upon particular games and sports has been characteristic of the educational order now passing its climax, so now recapitulation of fundamental occupations (of course with their appropriate measure of derived games) begins to be seen as a main educational resource and method of the opening future.

Thus, in fact, the whole question of technical and even of commercial education now arises before us; and these as standing in connection with nature study as a main primary preparation, and with geography (not merely descriptive, but occupational) as a main further element of secondary preparation, both lines of preparation as primarily and practical experience and quite secondarily of book work. The problem of education is thus not to increase the present overcrowding of new

"subjects," each to be treated by its teachers and examiners in its separate hour and compartment, but to unify and vitalise the whole by help of this literal "Return to Nature."[1] How can we from this contemporary "conflict of studies" return towards their completeness and harmony? How are the many and legitimate claims now before state and family, teacher and child—those of naturalist and of humanist, of utilitarian and of idealist, of statesman and of poet—to be practically harmonised in some reasonable and ever-increasing measure? And how may this be done so far as may be here and now, for the present generation of teachers and schools, and without waiting either for the infinitely distant completion of specialist sciences, or for the settlement of administrative machinery, as so many would have us do? These are the educational problems clearly before us, and particularly before the geographer, as the exponent not of any one special science of nature, nor of any one tradition of culture, but as the concrete synthetician of all these. Hence in a subsequent paper will be attempted more definitely to outline some of the contemporary experimental contributions towards this incipient educational synthesis, and especially of course those within the writer's immediate experience, which have been growing up for many years past in the Outlook Tower and its associated vacation and other studies.

SCOTTISH NATIONAL ANTARCTIC EXPEDITION.[2]

By W. S. Bruce, F.R.S.G.S.

Next month another expedition sets sail for the Antarctic regions. As is generally known, there are already three such expeditions in the field —German, Swedish, and British. Scotland sends out the fourth expedition. The value of so many Polar expeditions at the same time is questioned by some, but those who have an actual knowledge of our ignorance of this part of the globe see that there is room even yet for other expeditions at the same time in the same region. Few people realise the immense unknown area of that part of the South Polar regions, within which no human being has ever penetrated, but an idea of this area can be obtained when we find that it is possible to include in that area two and a half Europes or three Australias. The second largest unknown area of our globe is the North Polar regions, but even this territory can easily be included within the outline of Australia, whilst the British Isles fill a mere corner when placed within that of the North Polar regions. We do not know exactly the land area of Antarctica, but it is probably as great as the continent of Australia, and of this we only know a fringe of the coast-line along a very limited extent, and know nothing at all of the interior. With the exception of one sounding taken by Ross half a century ago, and of a few soundings taken this year by the Swedish Expedition, there is not a single oceanic

[1] Prophesied and prepared alike by Rousseau and Pestalozzi and many other living educationists before and since, and now happily coming within our reach.

[2] Read at the British Association Meeting, Belfast, 16th September 1902.

sounding travelling northward in the Atlantic within 3000 miles of the South Pole. We are almost in a similar condition of ignorance regarding the other great Southern Oceans, namely, the Pacific and Indian Oceans, only being able to point to a few soundings taken by the *Challenger* Expedition thirty years ago, and more recently by the Belgians and Germans. It is extremely improbable that the ships of the various expeditions will meet each other, so great is the distance between the sphere of each, although an attempt to co-operate will be made to make the work of each expedition join up with the work of its neighbours. Not only do the different expeditions work in different localities, but the work of these expeditions

The *Scotia* in the Caledonian Canal.

is distinct; thus, the German and British expeditions are fitted out in the first place to secure the best possible results in magnetism, and for this purpose the two ships, the *Gauss* and the *Discovery*, have been specially built for magnetical work at a cost of about £50,000 or £60,000 each. The work of the Swedes is mainly geological, whereas oceanography and meteorology form the basis of the Scottish expedition. Although each specialises in one or more sciences, yet it is not intended that this particular branch of science shall occupy the whole time of the expedition. All the ships have therefore been fitted out in such a manner as to enable them to undertake every possible form of scientific research in the localities they are visiting. Each vessel therefore contains not only implements but specialists in every branch of geographical science. So

much for the general idea of the scheme of work for the exploration of the Antarctic regions; now let me turn my attention more particularly to the scheme of work of the Scottish expedition, which I am naturally acquainted with more thoroughly than any other.

The object of the Scottish National Antarctic Expedition, as I have already said, is to specialise in oceanography and meteorology, and its sphere is to the south of the South Atlantic Ocean, between the tracks of the Swedish and German expeditions. Here it is intended to reach as far south as is compatible with the attainments of the best results to science. It is not my intention to allow the *Scotia* to be frozen in the ice as the German and British ships have been,

The *Scotia* in the Caledonian Canal.

although one must recognise that there is always a chance of being caught in this manner contrary to one's intentions, for I maintain that a ship is of the greatest possible value as long as she is a free moving agent and can go her own way in spite of many difficulties which may beset her. A wintering party, I consider, should not be too large, and should be entirely composed of educated men, and should set up a station definitely with a house on some point of land. Funds do not allow this in our case, unless some generous donor comes forward and helps us in the way we most desire. Our work will take place on or from the ship, which, as I have said, I trust we may be able to keep moving if not in the region we most desire, at least approximately in the neighbourhood of that region. The plan will, however, be to spend

the first summer and autumn in the Far South, well within the limit of the ice, and there to sound, trap, trawl, tow net, carry on meteorological, magnetical, and general geographical observations. During the winter we will retreat to the north and our operations will be carried on outside and up to the limit of the Polar ice. This part of the cruise will possibly be less enticing than the more southern cruise, for our work will be in a region of storms, and that during winter. If funds allow, a third cruise will be made during the second summer to complete the work begun during the first; also, as I have indicated, if some one comes forward with money, we have still an opportunity to set up a wintering station, where a wintering party could be left to carry on scientific

The *Scotia* in process of reconstruction at Troon, July 1902.

investigation for twelve months. The expedition will thus be absent for a period of about one to two years, according to the funds placed at our disposal.

The ship of the Scottish Antarctic Expedition was formerly a whaler named the *Hekla*. During the last seven or eight months this vessel has been so thoroughly overhauled that she is practically reconstructed and is absolutely as good as a new ship. This work has been carried out by the Ailsa Shipbuilding Company, Troon, under the able guidance of the eminent naval architect, Mr. G. L. Watson of Glasgow.

The vessel will be known as the *Scotia*, a name which carries with it an indication to all countries of the land to which she belongs. She is a barque-rigged auxiliary screw steamer of about 400 tons, having a

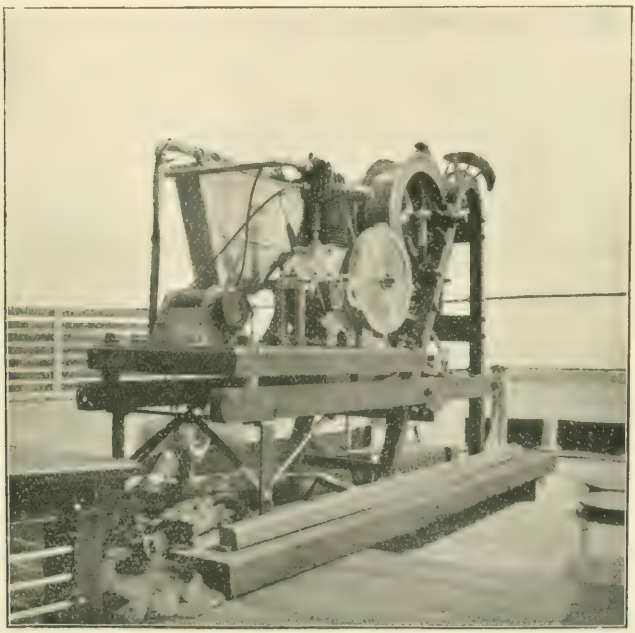
length of 140 feet and breadth of 29 feet, and drawing about 15 feet of water. With her new engines and boiler it is expected that a speed of fully seven knots will be attained. In spite of the immense strength of the *Scotia*, whose wooden walls amidships are no less than 25 inches thick, she is an exceedingly graceful craft, and it is a pleasure to look at her fine lines as they curve from her stem, which, it may be said, will meet the ice backed by nine feet of solid timber. Huge beams at frequent intervals will resist immense ice pressure, and I have little doubt that, besides being a good sailing ship, her form is such as will enable her to rise to ice-pressure and thus evade it.

The leader, the captain, and the scientific staff are accommodated in

Kite-flying at sea.

an after-deck house, the officers in a comfortable cabin amidships, whilst the crew are quartered forward in the fo'c'sl, which is not the least luxurious part of the ship. Simplicity has been aimed at, but at the same time necessities have not been neglected. The scientific work will be carried on in a deckhouse amidships, the after part of which forms the galley. Here there is good light for those who have to undertake delicate work, such as that with the microscope, hydrometer, and other delicate and finely graduated instruments. A second laboratory, mainly for zoology, lies almost immediately below the upper one, 'tween-decks, and is reached directly from the upper laboratory. Adjacent to this is a compact and completely fitted dark-room for photography. 'Tween-decks also will be found two great drums each containing 6000

fathoms of cable, each of which weighs six tons; this cable is led up on deck to a specially constructed forty horse-power steam winch, and from thence over the side of the ship by means of a derrick for the purpose of trawling and trapping in the greatest depths. The roof of the scientific deckhouse and its extension in the form of a bridge forms a centre of activity for the scientists, for this is where all the operations connected with sounding and the physical investigation of the ocean take place. Right aft on the poop is to be found an important instrument, namely, that which secures and hauls in, by a special motor engine, huge kites which suspend meteorological instruments at great heights in the atmosphere. This machine, as well as all the hydrographical machines, can also be



Motor-engine for reeling in kites.

driven by a special horse-power engine which is capable of hauling up instruments from the depth of the sea at the rate of 80 to 100 fathoms per minute.

The captain of the *Scotia* is Captain Thomas Robertson, of Peterhead, who has had over twenty years experience in Arctic navigation, and who, in addition, made a voyage ten years ago to the Antarctic regions. While he has been carrying on his work as a whaler, both in the north and in the south, he has found the time and shown the interest which has enabled him to make important geographical discoveries. He is in the proud position of being able to say that in all his experience he has never lost a ship nor a man. The scientific staff consists of half a dozen picked scientists; four senior, and two junior men. Mr. R. N. Rudmose-

Brown is botanist. His chief work will be to investigate the small oceanic "plankton" or those minute forms of animal and vegetable life which, through their feeble powers of propulsion, are drifted helplessly whither the ocean will. Mr. Brown is a graduate in science of Aberdeen University, and has, up to the present, held the post of chief assistant to the Professor of Botany, University College, Dundee. He has also had extensive experience at Kew, and in the British Museum under Mr. George Murray.

Mr. R. C. Mossman is the meteorologist and magnetist, and is almost too well known in meteorological circles to need any further mention than his name. He has undergone a course of magnetism at Kew Observatory. For fourteen years he has directed the chief meteorological observatory in Edinburgh, as well as an observatory in Glen Nevis, and on several occasions has acted as superintendent at Ben Nevis Observatory. In addition he is the author of about fifty papers on meteorological subjects, the most notable being his monograph on the climate of Edinburgh in the *Transactions* of the Royal Society, Edinburgh.

Dr. J. H. H. Pirie is geologist and medical officer. He is a graduate in science and medicine of Edinburgh University. He has worked at deep-sea deposits in the *Challenger* Office under Sir John Murray, and has been trained in field-work with the members of the Geological Survey of Scotland. He served with the Imperial Yeomanry in South Africa with distinction, and was promoted to a lieutenancy in the Royal Field Artillery.

Along with myself, Mr. Wilton undertakes the zoological work. Mr. Wilton has a wide experience of Arctic life and work, having spent several winters in the north of Russia, which enabled him to become an expert ski runner and an adept in all that pertains to sledging. In 1896 and 1897 he joined the Jackson-Harmsworth Expedition to Franz Joseph Land, and there assisted me in zoological work. Thereafter he returned to Edinburgh, studying at the University and Royal Colleges, attaining distinction in zoology and botany. During his vacations he has acted as an observer on the summit of Ben Nevis at the Observatory, and has since taken part in an expedition to Turkestan and Western China, whence he returned with collections which materially added to our knowledge of the fauna of these countries.

Two younger men will probably accompany the expedition as artist and taxidermist respectively. Their appointment, however, has not yet been definitely concluded. It is hoped that a bacteriologist will accompany the expedition, but this specialist appears to be one of those *rarae aves* which is not easily procurable. It is therefore possible that bacteriology will have to be carried on by one of those already mentioned.

These are the plans of the Scottish National Antarctic Expedition which sets sail next month, and I again appeal to men of science present to support, if not directly, at least indirectly, the efforts we are making to open up new vistas to human knowledge. Most scientists are not wealthy men, but many can afford at least to subscribe their guinea, and all can help to secure the interest of those who are blessed with riches

to use a portion of that wealth towards an object which they appear to consider worthy of support.

The accompanying photographs show the *Scotia* on her way to Troon, as well as the motor-engine for the kites, and one of the kites. In a subsequent issue we hope to exhibit the *Scotia* in her reconstructed form.

GEOGRAPHY AT THE BRITISH ASSOCIATION.

On Thursday, September 11th, the proceedings of Section E (Geography) were opened at Belfast by the President's address (see p. 505 of this number), which was listened to by a large audience. Later in the day Major Molesworth Sykes read a paper on "The Geography of Southern Persia as affecting its History." This paper we hope to publish in full in a subsequent number. Major Sykes showed how the trade-routes in Persia have been determined by geographical features, and spoke especially of the new overland cable to India and the course which it is to follow. In the subsequent discussion the President, Sir Thomas Holdich, expressed the hope that the existing telegraph line, which skirts the Persian Gulf, will not be allowed to fall out of repair, for though the new line is not only much shorter but is geographically in a more suitable situation than the old, yet it will be less easy to repair damage to it than to the latter. Sir Thomas Holdich appeared to entertain no doubt that the new line will end at Quetta instead of going *viâ* Kurachi like the present one.

No papers of directly geographic interest were read before the other sections on Thursday, but among those treating of kindred subjects should be noticed Professor Haddon's luminous address on the vexed subject of "Totemism" in section H (Anthropology), and an exceedingly interesting paper on the "Geology of the Country in the Neighbourhood of Belfast" by Professor Greenville Cole in Section C (Geology).

On Friday the first paper in Section E was read by Captain Ryder, R.E., and was upon the province of Yünnan, with special reference to the question of the feasibility of railway communication between Burma and China. Captain Ryder was attached by the Government of India to an expedition under Major Davies which was fitted out by the Yünnan Company to survey and report on Yünnan. One result of the survey was to show that, owing to the mountainous nature of the country, and the scanty population along the only feasible route, no railway could be constructed between Burma and Yünnan with any prospect of success. Captain Ryder, however, pointed out that although the railway between Tongking and Yünnan, now in course of construction, is French, yet much of the trade which now follows the route of the railway is in British hands. Captain Ryder describes Yünnan as a mass of hills with small plains nestling among them. The plains are chiefly inhabited by the Chinese, while the hills and deeper valleys are occupied by the original inhabitants, such as the Lolos, Shans, and so on; during their explorations the members of the

expedition found that these latter were as a rule much more polite than the Chinese, from whom they experienced considerable annoyance. There are some seventy walled cities within the province, but many of these are cities only in name. Each plain as a rule contains only one city, the official centre of the district. Geographically, the most interesting feature of the province is the large number of great rivers which flow through or rise within it, notably the affluents of the Irâwadi, Salwin, Mekong, Yangtse, West River, and Red River. Of these the Salwin, Mekong, and West River as they enter Yünnan all flow in deep valleys side by side for many miles, barely twenty miles from one another, with a huge mountain range intervening. Further south these rivers separate, allowing room for the headwaters of the Red and West Rivers, the centre of the province, the watershed between these various river-systems thus forming an elevated plateau, whose contained plains are mostly about 6000 feet in elevation. The climate varies according to the elevation, and there is also much variation in regard to the products. Some interesting views of terraced rice-fields were shown; from these two crops are regularly obtained each year, the rice being succeeded by peas or beans, etc. The roads are deplorable, and in consequence there is but little trade. Though large wild animals are absent, game is abundant, and there is considerable mineral wealth.

Mr. R. B. Buckley, C.S.I., then read a paper on "Colonisation and Irrigation in Uganda and the British East African Protectorate." He gave a general description of the climate and other conditions which obtain in the country crossed by the Uganda Railway. The high lands which the railway crosses stand at an elevation of 5000 feet above sea-level, and have a pleasant and temperate climate well suited to Europeans. If irrigation could be practised here there seems no doubt that practically all European crops and fruits could be grown. The rainfall in the high lands is about 36 inches per annum as against 40 inches at the coast-line. At present various attempts have been made to grow European crops, but the yield is in most cases light. It is probable that this may to some extent be due to want of experience as to the right season for sowing the different crops, but the success which has attended the efforts of Hindoo coolies and others who have practised agriculture on a small scale where waste water is obtainable at the sides of the railway, shows that additional water is a very important factor. But it cannot be said that there is much likelihood that irrigation could be successfully attempted on a large scale. The three main rivers, the Juba, Tanna, and Sabaki, are not well known, but it seems probable that the two first named might be used to irrigate the high lands, while possibly 30,000 to 40,000 acres might be irrigated from the Sabaki just below the point where the Tsavo river joins the main stream. Unfortunately, however, this area is infested by the tsetse fly, which might make cultivation difficult, if not impossible, and it is at best very small when considered in relation to the total area. While it is thus not probable that any large works can be undertaken, much might be done by the construction of small reservoirs among the hills, and the careful utilisation of the rainfall. The country, even without extensive

irrigation, would support a very much larger population than it at present contains, and Mr. Buckley strongly advocated colonisation by Europeans in the temperate tracts, and by Hindoos in the hotter parts. He suggested especially that efforts should be made to induce the Hindoos employed on the railway to settle permanently. Another portion of the paper discussed Lake Victoria Nyanza considered in reference to irrigation schemes, the author showing that owing to the enormous loss by evaporation and absorption the amount of water which is actually available for storage in the lake for purposes of irrigation is not so great as might be supposed. He also mentioned the occurrence of apparent anomalies in the readings given by the different gauges on the lake. He ascribed these to errors of observation or to defects in the gauges, but in the subsequent discussion it was suggested that they might indicate the existence of *seiches* in the lake—a suggestion which the author was however unwilling to accept. This paper aroused considerable interest, as was manifested in the discussion which followed.

Subsequently a paper on the "Survey of the Scottish Lakes" was read on behalf of Dr. Johnston, the substance of which has already appeared in our pages (cf. the August Number).

In the afternoon Prof. W. Libbey, Sc.D., read two papers, one on "The Jordan Valley" and one on "Petra," which were illustrated by some very fine photographs, some of which we hope to present to our readers at a later date.

The first paper discussed some of the geological features of the Jordan Valley, and the connection between the Dead Sea and the Gulf of Akabah, and showed that "there is less evidence of a fault with a subsidence upon its eastern side than has been supposed. There was, however, undoubtedly a rift valley or fracture, which was widened at a later period. This valley extended from the foot of Mount Hermon southward. The evidence of ice action on the southern slopes of Mount Hermon is very marked. This is not found upon the surface, where abrasion has probably removed all traces of it, but in places where the rocks have been covered up by moraines, which latter have but recently been removed. From the northern end of this valley, throughout its whole extent, the structure is strongly suggestive of that of a fjord where the ice has been absent for a very long period. A possible conception of the valley and its mode of formation might be that some time at the close of the cretaceous period this rift was formed. It was then widened and deepened by ice action, at least as far south as the Sea of Galilee, if not throughout its whole length. After this the surrounding region was submerged by a depression of its surface, due to lateral pressure from the westward. It was at this time that the immense deposits of sandstone took place which were laid down in the valley nearly as far north as the Sea of Galilee. The thickness of these sedimentary deposits was about 4000 feet, and their character varied according to the source of the material which was laid down. Subsequent to this a gradual elevation of the layers took place, and as long as the supply of water was abundant the stream cut its way down through the sandstone, leaving fringe-like remnants on both sides of the valley,

as well as an underlying mass in its bed. The protected lateral bays or alcoves on the sides of the main rift were found to be occupied by such deposits. The Lisan Peninsula might be regarded as a more resistant remnant than usual in the bed of the valley. After this process had continued for a period long enough to bring about the removal of some 3000 feet of this deposit, a change in the conditions took place, and one of three things happened, possibly all three:—1. The glacier disappeared. 2. The water-supply failed to a considerable extent. 3. The rate of elevation increased. Then the course of the water over the top of this sandstone 'plug' first became sluggish and finally stopped, thus breaking the connection with the ocean. From this time onward, while elevation to the extent of about one thousand feet took place, erosion upon this sandstone bed took place in two directions—northward and southward—and a harder layer than usual, about the middle of the trough connecting the Dead Sea and the Gulf of Akabah, eventually became the turning-point of the waters in both directions. This process is also illustrated in a similar remnant lying between the Jebel Usdem and the western face of the main limestone walls of the valley throughout the whole length of that peculiar range."

In the second paper a description was given of the city of Petra, "which is located in one of the larger bays or alcove valleys on the eastern side of the valley connecting the Dead Sea with the Gulf of Akabah. The depth of this bay inland must have been about seven miles. The immense amount of sandstone here laid down was apparently affected by surface erosion only, as it was withdrawn from the active scouring action which was going on in the main valley to the westward. It therefore rose or was lifted up some 3000 feet above that valley, while the limestone cliffs, its eastern shore-line, still towered above it to the height of 3000 feet more. As you look down upon it from the old Roman road on the top of these cliffs, it appears like a tumbled sea of sandstone waves, so rough is its surface. There is one channel, however, which has persisted in cutting its way down through this sandstone mass from the lower edge of the limestone plateau to a central depression with precipitous walls. This was the entrance to the location of the famous ancient city. The stream occupying this cleft, after passing through the central valley, plunges headlong down a splendid canyon, through several thousand feet of sandstone to the valley of the Arabah, which lies some five or six miles distant. This latter portion of the Sik is all but impassable; the upper portion, leading to the site of the city, is easily traversed, in fact it once had a Roman road leading along its winding bottom. The position of this 'Rock City' forms a marked contrast to other 'strong places' of Moab, which were usually walled hill-tops. It required no less military genius to grasp the elements of its strength and use them as a defence. The sturdy Roman was probably the only invader who became its foreign master, and he succeeded more by craft than by the force of arms. The strange juxtaposition of its temples and amphitheatre to the thousands of tombs which surrounded them produces a curious impression upon the mind. It seems odd to us that the games and joyous festivals of the people should be celebrated

in full view of the solemn porticoes of the last resting-places of their ancestors. The splendid structures carved in the walls of rock which surrounded their city have resisted the 'tooth of time' very remarkably for 1500 years, considering the soft material in which they are found. The city proper, with the exception of a single temple and part of an arch of triumph, has literally crumbled into dust."

Other papers of interest to geographers delivered on the same day were one on "Irish Rainfall," read by Dr. H. R. Mill before Section G (Engineering), and one on his recent expedition to the Indian Ocean, delivered by Prof. Herdman before Section D (Zoology).

On Monday, September 15th, the first paper read was one by Mr. J. Milne, F.R.S., on "World-shaking Earthquakes, with special reference to the recent volcanic eruptions in the West Indies." In the course of his paper, Mr. Milne pointed out that the usual yearly average of world-shaking earthquakes is about 50. Between January 1st, 1899, and January 1st, 1902, the number recorded was however 196, which the author tabulated according to the regions in which they occurred. In all cases the centre of origin lies on the flanks or near the base of the steepest flexure on the earth's surface. With the exception of those in the Balkan, Caucasian, and Himalayan regions all these centres are submarine, and their boundary ridges are for the most part lined with volcanic peaks. When a world-shaking earthquake originates on land, dislocations many miles in length have been formed, on the two sides of which large areas have been relatively raised or lowered. Thus, in Japan in 1891 a fault was formed having a length exceeding forty miles and a "throw," as shown on the surface, of ten or twenty feet; the Assam earthquake of 1897 was probably due to a movement of 10,000 square miles of country, along a thrust-plane, through a distance of sixteen feet; the Cutch earthquake of 1819 resulted in a subsidence of 2000 square miles of country, and the elevation of a ridge fifty miles in length. Similarly when the centres of origin of great earthquakes have been sub-oceanic, soundings have shown that vast depressions have been formed, whilst coast-lines have been raised or lowered. In 1822 about 100,000 square miles along the coast of Chile were permanently lifted about three feet. The result of these observations is to show that large earthquakes, originating like those of the past two years in the great furrows of the earth's surface, are accompanied by a deepening of the furrows and an elevation of the ridges which flank the furrows. The result of this elevation may be to relieve constraint at volcanic foci, so that volcanoes, especially those which have been sealed for many years, may suddenly burst into activity, a sequence of events well illustrated by the volcanic history of the Antilles. In these islands there were eruptions in the years 1692, 1718, 1766, 1797, 1802, 1812, 1836, 1856, and lastly the most terrible of all in the present year. All of these eruptions, with the possible exception of that occurring in 1851, seem to have closely followed huge adjustments of the Hayti-Jamaican fold, or similar adjustments in the neighbouring folds on the American continent. In addition to the great earthquakes, there occur every year some 10,000 minor shocks, which do not appear to have any sensible relation to volcanic activity.

Mr. Milne was followed by Dr. Herbertson, who gave a preliminary account of "The Windings of Evenlode," a tributary of the Upper Thames, which rises in the Lias plains and cuts its way through the Oolitic Limestone with great swinging curves to the Oxford clay plain. Dr. Herbertson pointed out the characteristics of the successive spins and combes of these windings, showing that four distinct stages of river development can be traced:—(1) On the plateau itself, where river gravels are found; (2) an intermediate and marked terrace, which seems to be more closely related to the valley floor than to the clay layers in the oolite; (3) the wide winding valley floor; (4) the stream meandering more or less erratically across (3). As quartzite pebbles cover the river gravels of (1) the river gravels antedate them, and may be pre- or interglacial. The windings whose forms have been incised in the present valley probably began on the Oxford clay at some 100-120 feet at least above the present level of the valley floor. There is some evidence of a strike valley running from the Windrush to the Evenlode at this time by Bridewell Farm, where the present tiny rivulet flows in a valley with wide swings, and runs to the Evenlode. Such swings do not occur in the brooklet tributary to the Windrush. The bar of the Oxford clay at the divide between Evenlode and Windrush in this valley is distinctly higher than either to the east or to the west of it. Dr. Herbertson is making a ten-foot contour-map of the district.

The next paper was by Mr. R. Lloyd Praeger, and was entitled "Geographical Plant-groups in the Irish Flora." According to Mr. Praeger, "Ireland may be roughly likened to a saucer, of which the central depression consists of a plain of carboniferous limestone, the rim of a discontinuous series of mountain-groups formed of non-calcareous rocks. Much smaller than Great Britain, it displays less diversity of climate as well as of surface, and consequently less diversity of flora. The application of Watson's well-known 'types of distribution' to the area is productive of some interesting results, and shows a considerable diversity of range in the same groups of plants in Great Britain and in Ireland. The 'English' plants of Watson reach in Ireland their maximum on the east coast, in Dublin, Wicklow, and Wexford, and are also remarkably abundant in Clare. Watson's 'Scottish' plants show a more uniform range in Ireland. They attain their maximum in the northern maritime counties. Thence they spread down the west coast in considerable abundance as far as the Shannon mouth, while on the east coast they decrease rapidly south of Down. Watson's 'Highland' plants are found chiefly in the west. They attain their maximum on the comparatively low hills of Donegal and West Galway, and are only sparingly represented on the higher mountains in the east, such as those of Down, Wicklow, and Tipperary. Watson's "Germanic" group is practically non-existent in Ireland: the fragments which have reached that country have a quite irregular distribution, with a maximum in Clare. The 'Atlantic' plants have a more definite distribution in Ireland, ranging round the coast and showing an increase southward. A careful analysis of the distribution of plants in Ireland reveals the existence of several fairly well defined types. There is a marked

tendency to a 'Central' or 'Marginal' distribution, the result of the configuration of the country, the Central group being largely composed of lowland, calcicole, and aquatic or paludal species; the Marginal of calcifuge, upland, and dry-soil plants. Well-marked northern and southern, eastern and western groups also exist, the boundaries between them consisting of lines running not exactly east and west, or north and south, but rather north-north-eastward from Cork to Londonderry, and east-north-eastward from Galway Bay to Dundalk Bay. For these six types of distribution the author proposes the names Central, Marginal, Ultonian, Mumonian, Lagenian, Connacian, the last four being taken from the old names of the four provinces of Ireland, in each of which one of the groups attains its maximum. The characters of each plant-group, and its relations to the climatological and physiographic features of the country were pointed out."

Mr. J. Porter then discussed the characters of the Cork River valleys, pointing out the peculiarities of the drainage system, especially the abrupt change of course which transfers each of the trunk rivers of the east from one longitudinal strath to a more southerly one, and the more or less straight and meridional character of the cross-courses. The author connects the abrupt change from one main strath to another with glacial interference, while he believes that faulting and the rapid flow of the pre-glacial streams conjointly determined the meridional character of the cross-courses and many of the tributary glens.

In the afternoon Professor J. Johnson gave an account, illustrated by a large map, of the peat-bogs of Ireland. The map has been prepared by the Intelligence and Statistical Branch of the recently created Department of Agriculture and Technical Instruction for Ireland, and shows the distribution of the bogs of Ireland, which cover 1861 square miles, chiefly in Counties Donegal, Mayo, and Galway, and have an average depth of 25 feet. An account was given of the character of the different layers of a bog as seen in a vertical section, and an explanation suggested of a bog-slide. Specimens of the bog-flora, of the different kinds of peat, and of the economic products derivable from turf or peat, lent from the Botanical Collections of the National Museum in Dublin, were exhibited.

Mr. C. H. Hawes then gave a description of the island of Sakhalin and its inhabitants. The island has hitherto never been explored by an Englishman, and its isolation is indicated by the fact that no communication at all is possible during half the winter, and during the remainder of it the inhabitants are dependent on native dog-sledges driven across the frozen Strait of Tartary. In regard to the discovery of the island, it may be said that the first known expedition to it was that of the Japanese in 1613, and they were followed by the Dutch captain Vries in 1643. La Pérouse visited Sakhalin in 1787; an English captain, Broughton, in 1796; and Kruzenstein during the years 1803-1806; but none of these succeeded in navigating the Strait of Tartary. Finally, in 1849, Captain Nevelsky demonstrated that, instead of being a peninsula, as had long been thought, Sakhalin is an island. Native legends are

still current which tell of a neck of land connecting the island with the mainland, and some support to these is given by the nature of the fauna and flora.

"A backbone of mountains, culminating in Mount Ktäusi, nearly 5000 feet high, stretches throughout the length of the island, which is little short of 600 miles. Except for clearings around isolated Russian penal settlements, the surface is mainly covered with dense forests, the home of the bear, reindeer, wolf, fox, sable, etc.; and though swampy regions exist, the general character is better described by the Siberian term '*taiga*' than '*tundra*.' Geologically, the island belongs to the Tertiary period, argillaceous sandstone and calcareous schist being much in evidence, while coal is abundant on the west coast. No traces of recent volcanic action are yet to hand. The middle of the island forms the watershed of two rivers, each with a course of about 300 miles, one flowing north and the other south. The climatic conditions comprise extreme cold in winter with heavy falls of snow, but the annual rainfall is less than that of England. The prevailing exaggerated notions of constant fog need to be dispelled. The inhabitants of the island consist of (*a*) Native tribes, and (*b*) Russians. With regard to the first, traces are found of extinct dwarf pit-dwellers, but the present inhabitants comprise five different tribes or races. (i) *Ainus*, in the south of the island; a dying race. (ii) *Gilaks*, a semi-Mongol, semi-Tungus tribe. (iii) *Orotchons*, a more pronounced Tungus tribe. (iv) *Yakuts*, with only thirteen representatives. (v) *Tunguses*, the great hunters of the island. As to (*b*)—Sakhalin is a Russian penal settlement, with a white population consisting wholly of convicts, ex-convicts, and officials. There are comparatively few political exiles, but a large percentage of murderers. Thousands of the latter are at large under surveillance. Many escape from the prisons into the forests."

Among papers of geographical interest read in other sections, mention may be made of one on "The Depopulation of Ireland: Its Causes and Economic Results," by J. H. Edgar, M.A., and of Professor E. C. K. Gonner's paper on the "Population of England and Wales in the eighteenth century," both read before Section F (Economic Science and Statistics).

On Tuesday, September 16th, the first paper read was by Dr. H. R. Mill, who gave a general historical survey illustrated by lantern slides of Antarctic exploration, under the title of the "Philosophy of the History of Antarctic Expeditions." Dr. Mill displayed on the screen the maps of Hecatæus and other Greek authors, showing the then known world embraced by the river Oceanus. He then traced the gradual development of the cosmogony of the Greeks, culminating in Aristotle's demonstration of the spherical nature of the earth. Considerations of symmetry demanded, according to Greek ideas, that once the spherical nature of the earth had been established, then the existence of an Antarctic continent must be taken for granted. A period of active speculation as to the nature and characters of this continent then intervened until the cessation of philosophical speculation which occurred at the beginning of the Christian era. To the early Christian Church

Aristotle's view of the nature of the earth was not only error but heresy, and all those who speculated as to the existence of habitable continents beyond the equator were cut off from the communion of the Church. Later, the travels of Marco Polo taught Europe that in the Indian Ocean the equator could be reached and crossed, and ultimately the Church withdrew its ban on the spherical theory, and a vast series of explorations, initiated by the sailor Prince Henry of Portugal, culminated in the discoveries of Vasco da Gama and Magellan, that both Africa and America were washed to the south by a ring of continuous ocean. The idea that within this ocean lay a rich southern continent, extending even to the tropics, gained from this period onwards wide currency, and though it had never been seen it was constantly figured on the maps of the sixteenth and seventeenth centuries. The hope of the discovery of this great southern land inspired explorers for five hundred years, and isolated discoveries by Drake, Davis, Bouvet, Marion, Kerguelen, and others stimulated the already existing interest, and aroused fresh enthusiasm. A large part of the interest was due to a hope of wealth in the new land, and at the time of the American War of Independence, Dalrymple made strenuous efforts to obtain a concession to annex, colonise, and govern as much of the unknown continent as he could discover in five years. One of his arguments was that it was better to devote British energies to a new and magnificent continent with a peaceful and gentle population rather than to attempt the subjugation of the rebellious subjects in North America. The concession was not obtained, and Cook's second voyage showed that the land if it existed was within the Antarctic circle, and was far indeed from the smiling land of the geographer's dreams. But though thus far the results of Cook's voyage were negative, his discovery of vast numbers of seals within the area led to a vast development of commercial interest in the region. Hundreds of ships were fitted out for the fisheries, and the profits at the beginning of the nineteenth century averaged £100,000 per annum, thus showing how great a commercial gain may result from observations undertaken on purely scientific grounds. Sailors like Weddell and others added much to our knowledge of the Antarctic region, but the gradual failure of the seal fishery led to the disappearance of the commercial motive for exploration. But the scientific motive remained, and between 1837 and 1843 three large expeditions were fitted out by the United States, France, and Great Britain respectively, chiefly in order to obtain exact data regarding magnetism, in order to give greater security to sailors on the great routes to India, Australia, and China. Of these, only the British ships *Erebus* and *Terror*, under the command of Sir James Ross, were adequately equipped, and it is to them that we owe very much of our present knowledge of Antarctic geography. With the exception of the Dundee whaling expedition, sent out some ten years ago, which was commercially a failure, all recent expeditions have been prompted by purely scientific motives, and have been concerned with research rather than with exploration. The expeditions of the *Belgica* and the *Southern Cross* have added considerably to our knowledge of the Antarctic, while

it may confidently be expected that the labours of the German, British, and Swedish expeditions already in the field, together with those of the Scottish expedition which is to start next month, will throw a flood of light on the problems of the Antarctic. Dr. Mill concluded with the following quotation from Dalrymple, which, though written about 1770 seems as applicable now as then: "Much is *still* within the power of men who may be rather *emulous* of the glorious spirit of *that age* than devoted to the mercenary or indolent disposition of the *present*, and who may be solicitous to *commemorate* their names to *posterity* amongst the *few* whom history still preserves from the general mass of oblivious insignificancy."

Dr. Mill was followed by Mr. Bruce, who gave the account of the Scottish National Antarctic Expedition which we print in this number. Mr. W. Spotswood Green, Chief Inspector of Irish Fisheries, then gave a brief account of his visit to the islet of Rockall, which took place in June 1896 in the SS. *Granuaile*.

"Rockall stands on a bank to the NW. of Ireland, cut off from the British plateau by an abyss of 1600 fathoms, covered with the globigerina ooze of the ocean depths, into which that plateau suddenly descends from a depth of 300 fathoms, the edge of the plateau being found to be composed, wherever the author has trawled, chiefly of erratic sub-angular blocks or boulders.

"The rock consists of a single tooth of granitoid rock, of such special character, that it bears the name of 'rockalite.' Close by the main rock, which is only 70 feet high and about 75 yards in circumference, the Haslewood rock appears above water at half tide, while two miles to the NE. a rocky ridge known as Hellen's reef comes within 6 feet of the surface, and constitutes the greatest danger of the locality. Within 20 yards of Rockall we got 30 fathoms of water, and soundings at a short distance from any of the rocks give 70 fathoms. The 100-fathom line follows the general outline of the whole bank. So far as soundings go, Rockall is more connected with the Arctic area than with the British Islands.

"From its situation the fauna of the islet and bank might be expected to differ from that of the British seas, and some interesting specimens of animal life not belonging to the British fauna were, in fact, discovered in trawling on the bank. The Great Shearwater was seen on the islet, but the nesting-place of this bird was sought in vain.

"In the sixteenth century one of Martin Frobisher's ships, a 'Busse,' when returning from the Arctic, discovered an island of several miles in extent about the position of Rockall. Rockall and its reefs are not referred to in charts or writings of that period. Whether this 'Land of Busse' could have been Rockall or not, prior to its last stage of denudation, has been fully discussed by Mr. Miller Christy; he inclines to the negative.

"The old charts also indicate an islet called Hybrassil, about 300 miles to the south of Rockall, and it seems a strange coincidence that this also should occupy a site approximately the same as the Porcupine

Bank, discovered within the last century, and rising as an isolated patch of shoal-water on the very utmost limit of the British plateau."

A number of photographs illustrating fairly well the appearance of this lonely isle were shown at the meeting of the Section.

Mr. Green was followed by Professor W. W. Watts, who, under the title of "Charnwood Forest, a buried Triassic Landscape," showed not only how the present geographical features of this locality are determined by its geological structure, but also how accurately it is possible to reconstruct the landscape at the period when the Triassic rocks of the region were laid down. In a very impressive way Professor Watts showed by lantern slides that there can be no reasonable doubt that, during the Triassic period, the Charnwood Forest area was subjected to desert conditions quite comparable to those now obtaining in Utah.

In the afternoon the following "Report of the Committee on Terrestrial Surface Waves" was read. It has been drawn up by Dr. Vaughan Cornish.

"Since the Glasgow meeting the observations upon drifting snow made in Canada during 1900-1901 have been worked up, and the principal results published in the *Geographical Journal* for August 1902, in a paper upon 'Snow Waves and Snow Drifts in Canada,' with notes upon the Snow 'Mushrooms' of the Selkirk Mountains.

"In this paper the forms of stationary snowdrifts (or sandhills) formed in the neighbourhood of fixed obstructions are for the first time brought into harmonious relationship with the forms of travelling snowdrifts (or sandhills). The former, when completed by the supply of sufficient material to fill in the whole of the eddy space, are *ichthyomorphic* structures of easy lines, with a fine 'run' and relatively bluff 'entrance' to windward.

"In the travelling drifts, or waves, on the other hand, the eddy space on the lee side is never filled up, as it continually moves forward (which is the wave motion), and the form maintains the fine entrance and blunt stern which is the aspect of greater eddy-making resistance.

"The observed shapes of incomplete snowdrifts (and sandhills) are numerous, but it is believed that all are circumscribed by the assigned ichthyomorphic boundary, the lines of which are finer in the case of snow than in that of sand.

"Progress has been made in the examination of measurements of deep-sea waves by different observers. It is found that the records of the velocity of ocean swells, observed after storms, have acquired a new interest from the recent reduction of about 25 per cent. in the factor used by meteorologists for calculating the velocity of wind from the records of the cup anemometer. Employing the newer values, it appears that the velocity of the longest observed oceanic swells in European waters is but little less than the greatest hourly velocity of wind reliably recorded on our coasts.

"An extended table of the heights of deep-sea waves as related to the velocity of the wind has been drawn up, in which it is found that when the scales of estimated wind force expressed by conventional numbers are reduced to a common standard, and the newer equivalent velocities applied throughout, fairly concordant results are obtained for observations by different observers made during different years from different ships.

"Observations have been made of the tidal bore in the River Severn, of which a successful cinematograph picture was obtained at Stonebench near Gloucester,

which has been described in the *Geographical Journal* for January 1902 ('Cinematographing the Severn Bore'). Observations of the bore have been made at other places on this river, and it is proposed to continue these, and to make similar observations on the River Trent.

"The pictorial record of terrestrial surface waves and wave-like surfaces has been extended by new photographs of the Severn bore at different stages, breakers in a storm, wave track of ship-models at the Admiralty Experiment Works, Haslar; the wave track of a torpedo-boat, destroyer, etc., and observations and photographs have been made of the movements of mud streams, which will be reported upon later. The grant has been expended, and the Committee ask for reappointment, with a grant of £25."

Professor Libbey then read a note by Sir Clements Markham on Captain Sverdrup's North Polar Expedition, Professor Libbey belonging to the *Falcon* expedition, whose members were the last to see the *Fram*. Sir Clements, in his note, gave details of the *Fram's* course, and of Captain Sverdrup's plans so far as they were known, and pointed out the steps which must be taken to effect a rescue should this appear necessary. In reading the paper, Professor Libbey gave it as his opinion that no rescue would prove necessary, and it must be a source of satisfaction to all to note that his prophecy has proved correct, and that Lieut. Peary, who arrived at Sydney, Cape Breton Island, on September 18, announces that the *Fram* left Godhavn on August 8, with all on board well, the party having lost only one member, a fireman, during its prolonged stay in the Arctic. On September 19 the *Fram* herself arrived at Stavanger, Norway, with all well. Professor Libbey then exhibited a number of Arctic slides taken during the *Falcon* expedition, under the title of "With Lieutenant Peary in Greenland." Of these, the illustrations of the peculiar nature of Arctic glaciers, perhaps, aroused the greatest interest. The usual votes of thanks subsequently brought to a close a series of meetings of great interest, of which the most striking feature was, perhaps, the beauty and scientific value of the slides exhibited by many of the authors of the papers.

GEOGRAPHICAL NOTES.

EUROPE.

International Council for the Exploration of the Sea.—Dr. H. R. Mill gives in *Nature* a summary account of the proceedings of this Council, which was held in Copenhagen in July last. The following delegates and experts took part in the meeting:—Great Britain, Sir Colin Scott Moncrieff and Professor D'Arcy Thompson, with Dr. H. R. Mill and Mr. W. Garstang as experts; Denmark, Captain Drechsel and Dr. M. Knudsen, with Dr. C. G. J. Petersen and Dr. Ostenfeld as experts; Holland, Dr. P. P. C. Hoek; Finland, Prof. Homén and Dr. Nordqvist; Germany, Dr. Herwig and Prof. Krümmel; Norway, Prof. F. Nansen and Dr. J. Hjort, with Mr. Schweigaard as secretary; Russia, Dr. Knipovich; Sweden, Prof. O. Pettersson and Dr. Trybom, with Prof. P. T. Cleve as expert. Two committees were appointed with instructions to draw up definite

proposals in regard to oceanographical and biological work respectively. In regard to the latter the Council has been obliged to considerably modify its original scheme, on account of the fact that most of the co-operating Governments have given money on condition that it be used exclusively in obtaining practical results of direct value to the fisheries, and not for the institution of researches of a purely scientific character. It was therefore decided to undertake two problems of immediate practical importance—the migrations of the most important food-fishes of the North Sea, especially the cod and herring; and the question of over-fishing in those parts of the North Sea, Skagerrak and Kattegat, most frequented by trawlers, with special reference to the plaice, the sole, and other flat fish, and to the haddock. Each problem is to be studied by international observations directed by an international committee, under a chairman and convener nominated by the Council. The oceanographical work is to be carried out by means of the steamers provided by the participating States. The representatives of the various countries handed in provisional schemes authorised by their Governments, the British scheme including two areas for research—the English Channel, west of the Isle of Wight, and the Faeroe-Shetland Channel.' The Dutch area includes the southern, and the German area the northern half of the North Sea; the Danes undertake observations between Faroe and Iceland; the Norwegians observations in the western North Atlantic, off the coast of Norway; and the Russians in the Arctic Sea. It is hoped that Belgium may undertake the eastern part of the English Channel. The countries possessing a coast-line on the Baltic divide that sea between them. The essential feature of the physical work consists of a simultaneous quarterly cruise by all the ships, employing instruments and methods of higher precision than have hitherto been thought necessary, and determining the horizontal and vertical distribution of temperature, salinity, dissolved gases, and also of plankton. In addition, the programme provides for securing an extensive series of surface observations, and samples from regular liners crossing the North Sea and the Atlantic, and also aims at utilising lightships and coast-stations for regular observations at frequent intervals, in order to connect the various periodical cruises and to enable a continuous record of the march of seasonal changes to be kept.

The work of the Council is to be conducted by means of the Central Bureau at Copenhagen and the International Laboratory to be opened in October at Christiania, with Dr. Nansen as Honorary Director.

Norwegian Researches in the North Sea.—The research steamer *Michael Sars* has recently completed a fortnight's cruise in the North Sea, during which some interesting results were obtained. The first week was spent in a series of studies on the distribution of animal life at various depths on the great submarine ridges known as Storeggen and Shetlandseggen. Dredgings were made with a 50-feet trawl down to a depth of 600 fathoms, in order to ascertain the distribution at various depths of the fishes used as food. It was found that there exists a very sharply defined boundary between the distribution of the food-fishes and of the deep-sea forms of life, this boundary corresponding to a rapid transition from water of a higher temperature to water just above or at freezing point. This boundary occurs on the slope of the Shetland ridge at a depth of between 275 and 300 fathoms.

A series of studies was next undertaken on the steep north-east slope of the Faero bank, where no fishing has hitherto been carried on. Experimental fishing was carried on for three days with most satisfactory results; nine lines were cast,

with a total of 5500 hooks attached to them, of which 660 were halibut hooks; the catches consisted of 117 halibut weighing more than 5000 kilos, 300 large cod, 500 brosme, 10 common ling, and 80 blue ling. This result is of importance because it points to a new and important area for sea-fishing, and to the existence of large quantities of halibut and cod at a time of the year when they are not to be found on the great bank or ridge on the coast of Norway. Both cod and halibut had herrings in their stomachs, although the catch was made at a depth of 200 fathoms.—*Nature.*

The Population of the Caucasus and of Russian Turkestan.—The region of the Caucasus, as is well known, is remarkable for the great diversity of its population, especially in its northern part, where alone there has been a considerable Slavonic immigration. About a quarter of the total population is of Russian origin, the Russians being especially concentrated in the north-east, but extending into the basins of the Kuban, the Kuma, and the Terek, and forming islets among the other peoples to the south of the chain. In the Caucasus and in the government of Stavropol there are some 2,450,000 Russians, and they preponderate in the towns both to the north and to the south of the chain. The other peoples speak about seventy different dialects, and live isolated from one another in the valleys and almost inaccessible gorges, jealously guarding their own type of civilisation. The proportions of the different races are as follows:—Caucasians or Mountaineers 10 per cent., Tartars 15 per cent., Georgians 15½ per cent., Armenians 12½ per cent., Kurds 3 per cent. of the total population; Persians form an insignificant minority of less than 1 per cent. Several indigenous tribes have already disappeared, and many of the others are threatened by the Russian advance. The Little Russians have colonised the regions situated to the north of the Kuban and on the lower part of its course, while the Great Russians are settled in the upper and middle regions of the Kuban, and on the whole of the northern side of the Caucasus. On the Kuban and Terek numerous military Cossack colonies have been formed, others have been founded by Russian sectarians; there are also settlements of Bohemian Czechs, and finally some 30,000 Jews.

Considering the regions of the Caucasus in detail, we find that North-West Ciscaucasia—the ancient Circassia—has very largely lost its original population of Circassians and Tcherkesses. The latter are now only represented by a few scattered families, lost in the mass of Russians. The Abasians, Abkhasians, or Absoua have similarly become greatly reduced in numbers owing to wars and emigration; while they were estimated at 150,000 in 1864, they now number only about 72,000. In the southern valleys of the Kuban, the Tartar and Musulman tribe of the Karatchaï seems to be holding its own against the dominant Slavs. Among other races represented in the district should be noticed certain colonies of Greeks, of Roumanians, of Kabards, and of Kara-Kalpaks. In Central Caucasia the Great Russians are dominant; the Kabardes, in spite of extensive emigration to Turkey, still number 32,000; there are some 110,000 Osses, and about 30,000 Nogaï Tartars, as well as some Turkmenes and Armenians. In Daghestan and the eastern part of Caucasia the Russians have made as yet but little headway, save in the basin of the Terek; and the composite races of the Tchetchens and the Lesghians, numbering about 700,000, are most widely distributed in the region. Both are mountain peoples, the former especially, inhabiting auls and being of wild and savage nature. Western Transcaucasia or Georgia has remained the uncontested home of the Georgians, which include perhaps the most beautiful of the human race. They have remained almost pure, few strangers having penetrated into the district, but stand low in morals, in

intelligence, and in general well-being. In addition to the Georgians, but dwelling apart from them, the district contains Tartars, who are shepherds and agriculturists, and Armenians, who chiefly congregate in the towns. Russian Armenia is inhabited by Armenians, Kurds, and Tartars or Turks. The Armenians are the preponderant race, owing not only to their numbers but also to their commercial and intellectual superiority ; but here, as elsewhere, are in the general case unpopular with their neighbours. The Tartars of the district are of Persian origin.

Russian Turkestan, with a total population of 5,300,000, only includes 23,000 Russians, but the work of Russification is proceeding steadily. Apart from the Russians, the population is made up as follows : Kirghiz 36 per cent., Sarts 24 per cent., Ouzbeks and Kiptchaks 19 per cent., Tadjiks 9½ per cent., Turkomans 5 per cent. As in the region of the Caucasus the Russians have advanced by first founding Cossack military colonies and then later introducing colonies of peasants and agriculturists, but in Turkestan their methods have been less brutal than elsewhere. They have respected the customs and religion of the warlike inhabitants, and have called priest and merchant to their aid in accustoming the latter to their presence ; their advance has also been facilitated by the lack of cohesion among the existing peoples.—*M. Paul Barré in Revue de Géographie.*

ASIA.

China and Europe.—M. L. Ryex discusses the question of the possibility of the peaceful penetration of Europe into China. In the first place he points out that the conditions which made the isolation of China possible and even necessary in the past have now ceased to exist. Bounded on one side by the ocean, and on the other by immense steppes and the loftiest mountains of the globe, she could not in former days hold intercourse with the world outside. Again, in her vast extent all climates exist, and, capable of cultivating a great variety of products, she became a world in herself independent of all the rest. To-day her roads are admirable and her canal-system incomparable ; communication within the limits of her empire is indeed easier than in many parts of Europe, for her mountains do not form an insuperable barrier between her districts. On the other hand, access from the outer world has not even been easy on the only open side, the eastern coast, for this has no great bays, no navigable inlets such as those which hollow out much of Europe. Hitherto her coast-line has been almost impenetrable. But many of these natural disadvantages have yielded to modern science. A great roadway has now been opened into the heart of China, for the huge Yangtse is at last constantly traversed by steamboats up to Hankow, and before long its upper reaches will be available for regular traffic. Again, the Yangtse is crossed by the railroad from Canton to Hankow, and Hankow to Pekin, these two great trunks draining much of China into the Yangtse. To the south the French are busy with a railroad which will penetrate towards Yunnan ; the English are discussing a line which will enter China through Burma ; the Russians intend to construct one from Lake Baikal to Pekin, so that one may travel from Paris or Berlin to Hankow without changing carriages ; the Germans are actively engaged with their lines in Shantung. Meantime it is remarkable how rapidly foreign interests are developing at Hankow, which already occupies the second place among Chinese ports. Not only is foreign commerce rapidly increasing, but what is perhaps even more important, Chinese ideas are rapidly becoming modified. The author's conclusion is that the isolation of China is breaking down, and that with the dis-

appearance of the conditions which produced it, it must necessarily also disappear. —*Le Mouvement Géographique.*

AFRICA.

The Port of Chinde.—Chinde is an important port on the Zambesi, with a population of 1300-1400, of which 1100-1200 are Europeans, chiefly Portuguese. The houses are usually built of wood, and are constructed by Chinese and Hindoo carpenters. Under the present governor, M. Pinto Cardoso, many improvements have been made, the streets are well kept, the houses have to be constructed according to a uniform plan, and drainage-canals have been constructed to carry off the surplus water from the swamps. In summer the heat is great, though it is tempered by south-east winds ; the winter lasts from May to October, and is cool. On the whole the locality is healthy ; tropical maladies are rare owing to the care which is taken of the water-supply, and there is little dysentery. As already mentioned, the wind usually blows from the sea and is cool, but on the rare occasions when it blows from the marshes the health of all suffers. Malaria-carrying mosquitoes appear in the rainy season, but are not common. There is but little game in the vicinity—some small antelopes, hippopotamus, and rarely crocodiles. The river eats away its banks with considerable rapidity—the rate of erosion has been estimated at 10-12 metres per annum—but the wasting has been effectually stopped by banking up in the vicinity of the landing-places of the Sharer Company and the African Lake Company, both of whom have now excellent quays. The commerce of the port is increasing ; it was 15,225 tons in 1899, and 17,316 tons in 1900.—*Le Mouvement Géographique.*

Rock-coloration in the Cataracts of the Nile.—The rocks which form the cataracts of the Nile have all a peculiar glistening black colour, which makes them appear as if varnished. The colour is present whatever the nature of the rocks, and is thus very deceptive. In the first rapid the rocks are syenites, pink and grey granites, porphyries, and other eruptive rocks ; in the second they are chiefly grits rich in iron and manganese, but all alike exhibit the brilliant black polish. MM. Lortet and Hugounenq have subjected specimens of the rocks to chemical analysis, and find that the colouring is due to a thin layer of black oxide of manganese deposited on the surface of the rock, and polished by the friction of the water. The oxide is not brought by the waters but has been derived in all cases from compounds of manganese present in the rock. The same black colour is noticeable in the rocks of the rapids of the Niger and the Congo, and is probably in both cases due to the same cause.—*Bulletin de la Société d'études coloniales.*

The French Congo.—The organisation of the French Congo and of the Chari has been modified by a decree promulgated on July 5th. The first article gives a new administrative organisation to the whole colony. The chief of the colony will continue to reside at Libreville, and his second will have his residence at Brazzaville ; the former may delegate to the latter all or part of his powers over any portion of the territory of the colony. In addition a special commissioner is associated with the Lieutenant-Governor at Brazzaville, whose function is to study more especially economic questions and to represent the administration in its relations with the *Sociétés Concessionnaires.* But the relation of this official to the Governor-General and Lieutenant-Governor is not defined. The second article is concerned with the organisation of the Chari. This district comprises the whole of the regions situated along the river Chari, to the south and south-east of Lake Tchad, and after its conquest was formed into a military district, placed under the command of Lieutenant-Colonel Destenave. To the same district be-

longs also the superintendence of Kanem and Ouadaï. The new organisation reduces the importance of the settlements in the Chari district. It now remains a simple province, retaining its financial autonomy, but attached to the government of the Congo, like the regions of Oubanghi and of Sangha. At the head of these is placed a simple administrator who is under the authority of the Governor-General. Thus the latter now controls the whole of the territories of the Congo and the Chari. Under the new arrangement all further action is at present abandoned in Kanem and Ouadaï, France however reserving the right to interfere when she judges the time opportune. Her present *rôle* in these districts is to be limited to general superintendence and pacification, with the view of gradually dissipating the prejudices of the population against the French. As the territory is guaranteed to France by the Treaty of 1899, she can without loss afford to choose her own time for effective occupation. At present it would be simply a waste of money to attempt this in view of the fact that no French merchant is established on the shores of Lake Tchad and no commerce exists. But this inaction does not involve total abandonment. The troops will be maintained on the Tchad, but only to carry out the work of superintendence and pacification; the officer in command will politically be under the authority of the civil administrator, and in a military sense under that of the commander at Libreville.—*Revue de Géographie.*

Identity of the Wam-Bahr Sara and the Upper Chari.—M. C. Maistre believes that there is sufficient evidence to show that the powerful river known as the Wam-Bahr Sara, discovered by him in 1892, is identical with the Chari, of which it constitutes the upper reaches. His party found the Wam-Bahr Sara to the west of the Gribingui, which it exceeds in size. They crossed it near the village of Garenki, where it was more than 300 metres broad and of great depth, but were not able to investigate its course. As M. Maistre had not seen the Ba Mingui, he contented himself at the time with chartering the three rivers, Ba Mingui, Wam-Bahr Sara, and Gribingui, as affluents of the Chari, but he considers that the observations of other explorers when joined to his own earlier ones, justify the conclusion that the Wam-Bahr Sara is the chief branch, that is, is the Chari.

When M. Maistre's party was some distance from the Gribingui, the Mandjias spoke several times of a large river running far to the west parallel to their route. In consequence when they subsequently encountered the Wam-Bahr Sara, they at once identified this with the river of which they had been told, and M. Maistre marked this river on his map as rising in the massive of Bolo, some little distance from the sources of the Nana and the Tomy. Subsequent research has, however, shown that the source of the Wam-Bahr Sara is situated much further to the west than was then supposed, for the explorations of M. Bernard prove that this river is the lower part of the course of the river Ouahame or Oua, discovered in 1895 by Clozel. The source of the Ouahame is close to that of the upper affluents of the Sangha and of the Logone, that is to say, it is close to the frontier of Kamerun. Captain Löfler in his journeys between the Sangha, the lower Chari, and the Logone, crossed several times the Ouahame-Bahr Sara and its affluents, and his observations seem to confirm the suggestion that the Wam-Bahr Sara is identical with the Chari.—*Bulletin du Comité de l'Afrique française.*

BOOKS RECEIVED.

We have received the following new books, which will be reviewed in due course:—

East of Paris. By Miss Betham-Edwards. London: Hurst and Blackett, 1902. Demy 8vo. Pp. xi + 275. *Price 7s. 6d.*

L'Inde Française au XVIII^e Siècle. Par Henri Castonet des Fosses. Paris: La Société de Géographie Commerciale, 1902. 8vo. Pp. v + 455.

Southern France, including Corsica. By Karl Baedeker. Fourth edition. Leipsic: Karl Baedeker, 1902. Pp. xxvii + 548.

La Russie. Par Karl Baedeker. Third edition. Leipzig: Karl Baedeker, 1902. Pp. l + 476.

Outer Isles. By A. Goodrich-Freer. Westminster: Archibald Constable and Co., 1902. 8vo. Pp. xv + 448. *Price* 12*s.* 6*d.*

An Autumn Tour in Western Persia. By S. R. Durand. Westminster: Archibald Constable and Co., 1902. 8vo. Pp. 266. *Price* 7*s.* 6*d.*

Stratford-on-Avon and the Shakespeare Country. By Harold Child. The New Guides. London: Grant Richards, 1902. Fcap. 8vo. Pp. vii + 152. *Price* 2*s.*

Progress of India, Japan, and China. By Sir Richard Temple, Bart. Nineteenth Century Series. London and Edinburgh: W. and R. Chambers, 1902. 8vo. Pp. xxxiv + 510. *Price* 5*s.*

Progress of Canada in the Century. By J. Castell Hopkins. Nineteenth Century Series. London and Edinburgh: W. and R. Chambers, 1902. 8vo. Pp. xxi + 538. *Price* 5*s.*

Sport and Politics under an Eastern Sky. By the Earl of Ronaldshay. Edinburgh and London: William Blackwood and Sons, 1902. 8vo. Pp. xxiv + 423. *Price* 21*s.*

The Highlanders of Scotland. By William F. Skene, LL.D. Edited, with Excursus and Notes, by Alexander MacBain. Stirling: Eneas Mackay, 1902. Demy 8vo. Pp. xviii + 427. *Price* 10*s.* 6*d.*

Aconcagua and Tierra del Fuego: A book of Climbing, Travel, and Exploration. By Sir Martin Conway. London: Cassell and Co., 1902. Pp. xii + 252. *Price* 12*s.* 6*d.*

Bournemouth and District. By Clive Holland. Pearson's Gossipy Guides. London: C. Arthur Pearson, 1902. 8vo. Pp. 174. *Price* 1*s.*

The Western Highlands. Pearson's Gossipy Guides. London: C. Arthur Pearson, 1902. 8vo. Pp. 160. *Price* 1*s.*

The Channel Islands. By S. Gallienne-Robin and Harold Child. The New Guides. London: Grant Richards, 1902. Fcap. 8vo. Pp. x + 124. *Price* 2*s.*

Switzerland. Illustrated Guide Books. London: Ward, Lock and Co., 1902. Fourth Edition. Pp. 240. *Price* 1*s.*

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THE SCOTTISH GEOGRAPHICAL MAGAZINE.

FORMOSA UNDER THE JAPANESE:[1]

BEING NOTES OF A VISIT TO THE TAICHU PREFECTURE.

By Rev. W. Campbell, F.R.G.S.

I have just returned from six months' travel all over the Taichu, or Middle, Prefecture of Formosa, and now make a few jottings for those who wish to know something about the present condition of things in that region.

It is thirty years since I first visited Taichu, but I was there frequently afterwards till 1894, so that the visit now to be referred to is my first since Formosa was ceded to Japan.

On arriving in the Prefectural City, I at once saw that there were many changes. It occupies that place where my familiar little village of Tang-toa-tun stood long ago, but much of the ground over which the New City is now spreading was one wide expanse of rice-fields when the Japanese took possession of the island.

I may say here that, at an early stage of our sojourn in Taichu, I called on the Prefect, Mr. Kinoshita, to pay my respects. He sat with me for about an hour chatting on Formosa matters in general; and I spent another pleasant evening at his official residence inside the city. It may be remarked in passing that graciousness of this kind towards any wandering "Red-haired barbarian" was quite unheard of here during the old Mandarin days. I valued very highly Mr. Kinoshita's kindness towards me, and it was no surprise to learn afterwards in different parts of the Prefecture that his subordinates serve him with loyalty and true devotion.

A native friend accompanied me on my first extended walk throughout the city, and pointed out such buildings as the Industrial Museum, the

[1] Read at a meeting of the Royal Scottish Geographical Society on May 29, 1902.

Head Post-Office of the Prefecture, and the spacious Law Courts, now under construction. I confess, however, he nearly took my breath away when finishing up with a visit to the Telephone Exchange, and the offices of the *Taichu Daily News*! Why, at the rate of progress I had been accustomed to in this part of the Beautful Isle, it would have taken centuries to evolve developments of this kind.

Several days after, I made a more leisurely inspection of two Government Institutions which greatly interested me. Dr. Fuzata is Principal Resident-Surgeon of the Taichu Hospital, and he was kind enough to act the part of guide when I called, conducting me himself over the buildings, and showing me the working of the whole establishment. He has several assistants under him, and in-patients are attended to by a staff of trained female nurses. I had also the benefit of Dr. Fuzata's explanations when being taken over the three large wards of the still incomplete New Hospital which is to supersede the one at present in use. This much more extensive set of buildings will certainly be an ornament to the Prefectural City, and provide relief for many a poor sufferer. I could not but admire the cleanliness, and the quiet, orderly way in which things were done in the Taichu Hospital; while even a cursory glance round the operating room and laboratory was sufficient to show that the methods of healing followed here are thoroughly up to date. Many people do not know what an improvement all this is on our experiences of the past, for I have more than once seen wretchedly sick and wounded Chinese soldiers left to die like dogs by the roadside in Formosa.

The second Government Institution which interested me was none other than the Prefectural Prison. Formosa has always contained a considerable proportion of bad characters, and it is by no means an easy task to find out the best way of dealing with them: for cruel severity drives away all self-respect, and leads only to reckless despair; while a do-nothing, or too lenient policy, tends to the increase, rather than the diminution, of crime. *Ab alio exspectes, alteri quod feceris.*

Under the Chinese, it is safe to say that criminals in Formosa were treated with the most shameful inconsiderateness and brutality. I was never then hindered from visiting prisons or speaking a word of advice and comfort to their miserable inmates; but such scenes of filth and iniquity were never witnessed by me anywhere else, and I have been in some very strange places during my long residence in the East.

When I called that day on the Governor of the Taichu Prison, he at once came with me from the *Kencho* where he had been seeing some of the officials, and placed himself at my service during the greater part of the forenoon—from ten o'clock till about noon.

A ten minutes' walk brought us within sight of the strong, heavily buttressed walls of the prison. Those walls are twelve and a half feet in height, and enclose an immense amount of space, in which are grouped the open courts and main buildings of the prison; those buildings being spread out like an open fan, and arranged with so much design that any officer sitting on the raised seat at the converging end has practically the entire prison under his eye.

Let it be remembered that there might be over one thousand strong, desperate men confined here, and there can be no wonder at the precautions taken against fire, plague, sudden uprising of the prisoners, and every other contingency. No one may ramble at large through this collection of huge buildings, for the passages are patrolled night and day by armed warders, and the heavy iron-bar gate at the end of each long, wide middle corridor will be unlocked by the sentry on guard, only in accordance with strict rules which have to be carried out to the letter.

With much thoughtfulness, the Governor led me first to where prisoners are received and submitted to all sorts of examination; then to the extensive bathing quarters; from which we went to the hall where culprits exchange their own clothes for prison garb, and afterwards to the large workrooms, dormitories, dining-halls, and kitchens; our peregrinations coming to a close in the commodious quarters of the prison staff. The whole thing was intensely interesting to me, because on every hand one could see the operation of high intelligence, firmness, and even of mercy in grappling with evils which are found amongst people of every land.

Before coming away, the Governor remarked to me that the entire group of buildings, including the surrounding wall, was the outcome of convict labour; and it did, indeed, seem to be a feature of the system here that no prisoner was allowed to shirk duty who was really able to work. Nor can any one question the soundness of this principle, for the healthful appearance of the large companies I saw engaged in the manufacture of straw mattresses, and as brick-makers, builders, carpenters, and coolies, was in favour of it; while statistics given me regarding the after-career of those who had served their terms of confinement also showed that prison-life in Taichu was both bearable and distinctly reformatory in its tendency.

I was sorry I came away without learning even the name of the obliging Chief Officer who had thus enabled me to see so much of the working of a Japanese prison. He truly seems to be the right man in the right place; and his whole manner conveys the impression that the more advisable course would be to obey his orders at once without any questioning or delay.

It is easy to see that Taichu city is sure to become an important centre before long; for, to mention only one thing, that great mountain region lying eastward will soon be pouring out its treasures into it. Indeed, a beginning has already been made in this direction, and I can still recall the pleasurable feelings with which my wife and I stood aside one day while many tramway carriages passed us, on which were piled about six hundred cases of camphor oil being taken out westward for shipment near the little market town of Thaw-kat-khut.

The want of accommodation for shipping in this part of the island is what is most to be regretted; but, after huge undertakings like the Osaka Harbour, or the great sea-wall at Yokohama, something could certainly be done. A few hundred thousand dollars spent in dredging and construction work at Hoan-oah, Lok-kang, or Thaw-kat-khut, would

work wonders by giving a great impulse to trade throughout the Prefecture.

A glance at any of the recent maps will show the possibility of another scheme, that of pushing ahead with even a narrow tramway line from the south-east corner of Paw-li-sia through the Bu-lai Plain, and on round the base of the mountains, so as to connect with one or other of the rivers debouching at Hoe-leng-kang. Paw-li-sia, with its thirty hamlets, has already become an important official centre; which, under ordinary walking conditions, lies only a couple of days' journey from Hoe-leng-kang. Then, on the south side of Hoe-leng-kang itself, and at the mouth of that river which winds along the foot of the hill trending westward, no great outlay would be required to provide safe anchorage for a number of vessels.

Of course it will be said that harbour room at Hoe-leng-kang made accessible from the west, as now suggested, raises the question as to how the head-hunting savages are to be dealt with; but even this consideration does not present an insurmountable barrier, because I know that the Kantaban tribe, occupying the mountain ranges south-east from Paw-li-sia, could be much more easily managed than the bloodthirsty Ban-hoan and Bu-hoan further north; while from the base of operations at Hoe-leng-kang, it would not be difficult to make a safe movement into the mountains so as to meet any party working from the Paw-li-sia side.

However, from personal observation along both the eastern and western coast-lines, I should like myself to see a commencement made in the way of providing harbour accommodation for Taichu at such a place as Hoan-oah. In former years a considerable carrying-trade went on there, and within the natural harbour formed by neighbouring sand-banks—now much silted up on its eastern side—five or six good-sized junks could still ride out the severest typhoon.

On the visit I am now referring to, Mrs. Campbell and myself spent five weeks among the Paw-li-sia villages, that inland region having been reached by us across the mountains from the Prefectural City, travelling by way of Thaw-sia, Ku-a-thau, Pak-kang, and Sio-paw-sia.

One thing which arrested my attention on the second day of our journey was the immense amount of timber which had been recklessly cut down and allowed to lie and rot on the ground; a very objectionable practice which the authorities had put a stop to, as it was no unusual thing for the Paw li-sia Sek-hoan to destroy hundreds of most valuable trees in this way, their object being to give the savages less opportunity for making their stealthy murderous attacks upon travellers, or on deer-hunting parties out from Paw-li-sia and the West.

The sight of so much waste, and of the still untouched forests on every side, reminded me of the fact that, many years ago, two of my fellow-countrymen settled down at a place several miles south of Saw-o in the hope of carrying on profitable trade in preparing and exporting wooden battens which carpenters and wood turners could work up into all sorts of articles, but who had to leave under orders from the British

Consul just when their labour was beginning to yield very satisfactory returns. Such an industry might be profitably carried on with the help of some simple form of turbine.

The principal item towards starting an undertaking of this kind in Formosa would be a sum of about five thousand dollars to provide the necessary plant, because buildings would not involve much expense if made of bamboo framework, wattle-and-dab walls, and grass roofing. Good sites could be found near Lau-long in the Tainan Prefecture, at the foot of the mountains east from Lim-ki-paw, or along the banks on the upper reaches of the Tai-kah river, for in each of these regions thick forests are at hand, with good-sized streams for the conveyance of water-power, as well as for floating those long, shallow catamarans which bring out all sorts of produce from the interior. There can be little doubt that the authorities would deal in a liberal, helpful way with every such attempt to open up the country.

While crossing the high mountain ranges into Paw-li-sia, there was still one more reminiscence that came into my mind. It was that of an attempt made nearly thirty years ago by myself and my only colleague at the time to introduce the cinchona tree into Formosa. The Franco-German war had then greatly raised the price of quinine, and as this medicine was much in demand throughout the southern part of the island, we thought it might be feasible to grow it ourselves. Accordingly, seeds and instructions were forwarded to us, on request, from the Government gardens at Calcutta, and experiments were entered upon forthwith.

These were successful to the extent of bringing up several plants to about a foot in height, although very careful work was needed in preparing the soil and in regulating the proper amount of moisture and sunshine. However, missionary duties became more pressing about this time, while an almost fatal necessity arose when the little saplings were ready for transplanting to some mountain region about three thousand feet above the level of the sea; but our efforts were not given up till we became assured that the cinchona tree could be got to flourish in many parts of the island.

Now, as the highlands of Formosa are much more accessible than formerly, what is there to hinder an attempt being made by the Government, or some private Company, in the direction of cinchona cultivation? After the coffee blight in Ceylon, the planters there immediately turned their attention to tea, india-rubber, cinchona, and other such products, with the result that the Colony is now in a more prosperous condition than ever it was. It would seem, however, that the Formosa Government is fully alive to all such possibilities, for Mr. Acting-Consul Wawn's last Report contains the following significant statement:—"The Government has shown great energy in establishing [camphor] plantations, the first being made in 1896. When the camphor monopoly was established in 1899, fresh plantations were made, and in addition to the main plantation, there are now two plantations in Taihoku prefecture, four in Taichu, one in Tainan, and one in the district of Gilan. The cultivation of camphor-trees has lately been attended with very successful results,

the number of young trees suitable for transplantation reaching more than one million."

As to the tenure of land in Formosa, it may be remarked that, excluding those regions still under control of the savage tribes, foreigners are permitted to hold leases up to one hundred years in any part of the island. I did not, however, take advantage of this concession in the case of church property, but saw the officials about having deeds made out in the names of several Sek-hoan brethren, acting on behalf of the native Church.

During my stay at Paw-li-sia, a subject on which I had many talks with our Church people and Japanese friends was that of education. And there was no way of evading this, because (1) our own little congregational school here had been closed owing to the children having all become pupils in the free Government schools established for their benefit; (2) two young men who formerly attended our Theological College in Tainan were now teachers in those Government schools; while even Law-tek, the daughter of our Aw-gu-lan preacher, was teaching in a Government school which had been opened for the education of girls—those three young persons receiving a very much higher salary than our Mission had ever paid to such workers; (3) one day soon after my arrival in Paw-li-sia, a uniformed Japanese official called on me with the request that I would write to Tainan with the view of inducing two Christian young women to come up and carry on teaching work amongst the girls here. He was pleased to add that his observation of the Church people in this neighbourhood had led him to think favourably of their diligence and conscientiousness; so much so that he could promise now that, if any two capable girls of about twenty years of age came here to act as teachers, they would have suitable quarters provided for them, be allowed good monthly salaries, and not be asked to do anything inconsistent with the requirements of their religion.

One or two general remarks on the subject of education in Formosa may make matters somewhat more intelligible at this point. Under Chinese rule, the schoolmaster was, indeed, very much abroad throughout the island, but the officials took no notice of him; while his own cumbrous methods, with his inability to teach such simple branches as arithmetic and geography, placed the boys and lads under his care at enormous disadvantage. His pupils had also occasionally to go through certain idolatrous observances which we professing Christians could never be brought to countenance. Of course, too, the idea of schools for girls never entered into the minds of people outside of the Church at that time.

The two Missions in Formosa have always given much prominence to the educational part of their work. We do everything we can to encourage the formation of little local schools and reading-classes, at which the boys and girls connected with our congregations may receive a fairly good elementary training. Then, at headquarters in Tainan and Tamsui, there are large Boarding Schools for boys and girls, where more advanced work is carried on, and where scholars are initiated into

the art of teaching, or prepared for that still higher course which is meant to fit young men for becoming the future evangelists and pastors of the Church. It need hardly be added that the Bible is in constant use in those elementary and advanced schools, and that all parents and relatives know of the distinctively Christian influence which pupils come under after their enrolment.

When the Japanese took possession of the island which had been ceded to them in 1895, they at once saw that measures on a very liberal scale were needed for educating those millions of people of strange speech who had thus been brought within limits of their Empire; and, accordingly, when several Departments were created for the Government of Formosa, such as those for Finance, Police, Public Works, Agriculture, and Communications (the latter taking cognisance of roads and railways, with postal and telegraph work), an Educational Bureau was also formed, and soon entered upon its duties by opening Free Common Schools in every important district and township of the island. At these, a prominent place was given to instruction in the Japanese language, as well as in arithmetic and geography, but qualified Chinese teachers were also engaged to carry on the instruction they had been accustomed to. A thoroughly equipped Medical College was afterwards established at Taihoku, and other Technical Schools for qualifying young natives to take up appointments in the Postal Telegraph, Customs, and other branches of the public service. The great enthusiasm thrown into all this work will be understood on remembering that boys attending Common Schools, who stand well in their examinations, are passed on to one or other of the Higher Institutions at Taihoku, where they receive slightly larger monthly allowances during their years of probation than our Mission pays to unmarried young men who have gone out as preachers at the close of their College course. Another thing which shows the energy thrown into this work is seen in the immense number of publications continually being issued by the Formosa Education Bureau; those publications including thousands of volumes in every leading department of secular knowledge, with dictionaries, maps, wall sheets, and valuable Reports from the various departments of the Executive.

I was, however, chiefly anxious to learn the influence our Church children came under when going to those Government schools instead of to the congregational schools we had hitherto been dependent upon; and so far as this was concerned, there seemed to be a consensus of opinion amongst the native brethren on several points. For one thing, those brethren thought the profession which the Government made of granting entire religious toleration to the people of Formosa was a *bonâ fide* one; because, while the Bible was not used in their schools, all books which favoured Buddhism or any other form of native religious belief current in Japan were also rigidly excluded. Moreover, no objection had been taken to Law-tek and others giving lessons from our Christian hymn-book to any pupils who wished for assistance of this kind—out of school hours.

Those brethren with whom I was conferring also admitted that

their children obtained many substantial advantages in going to the Government schools; such as free tuition of a very effective kind, strict but not severe control of the pupils in fine airy buildings, instruction on subjects that would really fit them for future work, and opportunities for acquiring a knowledge of the Japanese language they could not get elsewhere. Much stress was laid upon this last-named item; for those converts were shrewd enough to have noted that any well-behaved young man of ordinary ability who could speak Japanese with fluency, might assure himself of easy and well-paid interpreting or clerical work in any of the numerous Government offices scattered over the island.

On the other hand, my native friends told me they were not less assured of one fact more, namely, that it had a decidedly deteriorating effect for their children to be thrown much into the companionship of those who knew nothing of the precepts and the power of Christianity in their own lives; and in corroboration of this, instance after instance was cited to me of boys whose former conduct was irreproachable, having acquired the habit of gambling and of using horribly obscene language in their ordinary conversation, all this being traceable to friendships they had formed with the children of people who would not have anything to do with the Church.

Indeed, continued inquiry seemed only to increase the complexity of the problem thus brought before us; but our Church people kept waiting for me to say something that would solve their doubts, and it was simply impossible for me to deal in an evasive way with the courteous request which an officer of the Education Department had presented to me in person a couple of days before. Accordingly I at once sent down to my colleagues in Tainan an account of all the circumstances; my letters also stating that the proposal to bring qualified young Church members for work in the Government schools seemed to me a perfectly feasible one, as it would furnish them with a rare opportunity for becoming lights in the world; and that, while such employment might carry some temptation with it, this is only what could be said of every other position in life.

It was not so easy to advise our native Christians as to their duty in this matter, because any statement from me had to be made in view of the constant rumours then prevalent that an official order was about to be issued necessitating the attendance of all Formosa children at the Government schools. I commended their own view of the position, their appreciation of the substantial advantages provided for them in those schools, and their fear lest too high a price were paid for those advantages by moral injury being done to their children in the way they had pointed out. I also reminded them that the teachers of those schools in Paw-li-sia—of whom three were members of our Church in full communion—had confessedly no sympathy with the evils complained of, and that, if the Christians here only did their duty with faithfulness, there was good hope that a better state of things might soon prevail.

On our journey out from Paw-li-sia, we were accompanied by an armed guard of Sek-hoan Christians, and our large party had rather an imposing appearance as it marched in Indian file across the lonely

mountains and plains out towards the west. I was not myself favourable to the Church taking on so militant a look, but the savages had become very active of late, and every one thought it right for precautions of this kind to be taken.

After coming out from Paw-li-sia, our visitation of the Churches led us in nearly every direction over this westward side of the Prefecture. It was while thus engaged that my attention was repeatedly called to companies of apparently far-travelled country-folks marching along with bottles, and those short lengths of bamboo which are made use of in Formosa for holding liquids. On making inquiry, I was told that they were all going to the village of Sa-te-chu in order to obtain a supply of "Genii-water" as a protection against plague and for cure of the opium habit; an answer which, of course, only excited my curiosity and made me resolve on proceeding myself to Sa-te-chu, so as to find out what was really at the bottom of this rapidly spreading movement. Nor need I withhold another reason which influenced me at the time: for there could be no mistaking the rumours then afloat, that those "Genii-water" gatherings might take a serious anti-Japanese form and result in injury to the Church itself; injury like that which took place several years ago in a village further south, where no fewer than nineteen Christians were cruelly murdered for their alleged complicity in bringing the Japanese into Formosa.

A remark or two before stating what I saw in Sa-te-chu may make matters a little more intelligible. For one thing, let it be noted that the pilgrims I questioned all seemed to agree as to the way in which this holy-water cure had come about. Two humble, earnest-looking men had recently been seen worshipping in Koxinga's Temple near Sa-te-chu and in the meritorious act of sweeping it out after finishing their devotions; but this so much impressed one of the villagers, who was passing at the time, that he reported the matter to his neighbours, who came out to find those two devotees in the act of blessing the well behind the Temple, just before they mysteriously vanished out of sight!

It will be well also to remember that Koxinga was the great Pirate-chief who expelled the Dutch from Formosa in the seventeenth century, and whose name again came prominently before the people of the island so late as 1874. During that year the Japanese had a large military force in Formosa punishing the savages for having wantonly murdered a boat-load of their countrymen; but, after this punishment was meted out, Japan declared that the victorious troops would not evacuate the place till China agreed to satisfactory terms regarding the payment of military expenses, and keeping her savage subjects under proper control; whereupon some deep thinkers on the China side suggested the erection of a temple in honour of Koxinga; their argument being that, if this pirate had expelled the Hollanders in former days, his daring spirit should be invoked against the present invaders of Formosa.

There was only one little difficulty in the way. Imperial canonisation is often a necessary condition of admittance to the Chinese pantheon, whereas Koxinga had been a notorious rebel at the beginning of the

present dynasty. In the face of all this, however, the humble petition to the Throne on his behalf was graciously received, the *Advocatus Diaboli* lost his case, an imperial rescript was issued sanctioning the erection of Koxinga temples; and soon after, Japan did really withdraw her troops, scarcely any person in Formosa knowing at the time that this was due to the friendly intervention of Sir Thomas Wade, the British Minister at Peking, and not to any help derived from the spirit of Koxinga.

The last thing to note in this rather long digression is that, before starting for the village of Sa-te-chu, I had met with many quiet indications of the rather widespread and deep-seated anti-Japanese feeling which exists at present amongst the people of Formosa. I do not say anything now as to the reasonableness or the unreasonableness of this feeling of discontent, but only remark that it does exist, and does manifest itself in very unmistakable forms from time to time.

Thus, the conditions under which my visit was being paid will be apparent. I was going to a temple of Koxinga, and the crowds now making their pilgrimage to it were being comforted here and there with veiled remarks about Koxinga having served them well on a former occasion, and that it was hard to say what he might be willing to do for them again.

I thought it as well that Mrs. Campbell should not accompany me to Sa-te-chu, so left her to await my return in a little market-town some five miles to the south of it, only a young native coming with me as travelling companion, and to assist in making observations.

The village lies on the south bank of the Tai-kah river, and is about three miles inland from the coast-line. It presented a busy scene on the day of my visit, for the usual daily four to five thousand pilgrims were pressing in, all of them eager to engage in the various observances which others had gone through. These observances included the burning of incense sticks and gilt paper inside the shrine, obtaining protection against the prevalent epidemic by fastening little packets of incense ashes from their necks, and filling their bottles from the well behind the temple.

For several reasons I did not consider the occasion a suitable one for open-air preaching, but I mingled freely amongst the people, who were quite communicative, telling me where they lived, what led some of them to come very long distances, and the benefit they hoped to derive from dosing themselves with the holy water.

The mass of them impressed me as being wholly innocent of uniting in any rising against the Japanese, although I believe that observant mischief-makers were not far off, and were prepared to turn things to their own advantage; a view of the position which seemed to be correct from the fact that, on several rival shrines having been set up in other places, the movement spread to such an extent, and became so disturbing, that the authorities put a peremptory stop to it.

My visit, however, was not fruitless in another direction, for the inquiries I then made threw some light on a subject which has been much canvassed of late—I refer to Japan's present policy with regard to

the consumption of opium in Formosa. It was the frequency with which the Sa-te-chu pilgrims told me that their object in going there was to obtain deliverance from the opium habit which first attracted my attention, and led me to ask similar questions in other parts of the Prefecture, with this result, that about eight out of every ten of the devotees I spoke to confessed they were suffering from the use of opium, and would give almost anything to be freed from the bondage into which it had brought them.

Before the arrival of the Japanese at the close of the war with China, it is well known that opium-smoking was very prevalent amongst the people of Formosa; the drug in its crude state being imported by foreign mercantile houses and then passed on to native dealers throughout the island, after the heavy Customs duty had been paid upon it. With regard to the quantity of opium then brought into Formosa, our British Consular Reports give the following figures:—In 1891, the opium imported was valued at £463,860; in 1892, at £378,450; in 1893, at £419,839; and in 1894, at £365,813. These were the four last complete years during which this trade was carried on under surveillance of the Chinese Customs.

As to the attitude of Japan in regard to the opium trade, it may be said that the Government at Tokyo has never wavered in its opposition to opium as an article of commerce; and this opposition, coupled with a general knowledge throughout Japan of the origin and consequences of the trade elsewhere, has led to the Japanese having kept themselves wholly clean from the enervating effects of the opium curse.

In these circumstances, the plan of gradually working up to entire cessation of the trade was commenced on 23rd February 1896, when opium became an article of strict Government monopoly in Formosa; this decision being followed soon after by the purchase with State funds of large quantities which foreign merchants had stored up at the time, the importation of crude opium by the Government on its own account, the erection of refineries at Taihoku to make it ready for use, the sale of licences to a vast number of retailers and consumers, and the employment of many officials throughout the island to deal with evasions and infringements of the regulations which had been published.

Turning now to the carrying out of this system, we find from Consular Reports that the Government importation of opium to Formosa in each of those complete years for which figures are available stands as follows:—During 1897, the amount thus imported was valued at £145,668; in 1898, at £204,139; in 1899, at £294,930; and in 1960, at £360,464. In addition, however, and remembering those large purchases which were made from foreign merchants in 1896, it should be noted that even this rapidly increasing rate of importation does not show the recent actual dimensions of the opium trade in Formosa; for, during 1899, the value of prepared opium supplied to licensed dealers by Government agents reached £447,524; and in 1900, to the enormous sum of nearly £450,000 sterling.

Nor is it easy here to forget three more facts: *first*, the Government's increasing financial embarrassment in attempting to carry out an almost

too generous programme of public improvements in Formosa; *second*, the substantial profit which Government derives from its opium monopoly, this profit amounting last year to more than £100,000 sterling, even after paying for the yearly supply of crude opium, with all the expenses of refining and distribution; and *third*, that, while 165,752 male and female natives of Formosa—or, 6·18 per cent. of the whole population—are now paying for licences to gratify their pernicious craving, any Japanese subject who takes to opium-smoking thereby commits a crime, and renders himself or herself liable to penal servitude.

It should be noted that Formosa is not the only field in which the Japanese have appeared as colonisers; for, while the Luchu Islands were till lately governed under a monarchy of their own, they now form the important Okinawa Prefecture of Japan; and, despite the peculiar language and customs which were prevalent there, the process of absorption was accomplished both with quietness and to the great advantage of those islanders. Several years ago Luchuans were scarcely ever seen in Formosa, but now they are frequently to be met with, and their well-stocked shops are to be found in all the more important centres of population.

Then, although the Sandwich Islands cannot be called a possession of Japan, the business-like way in which subjects of the Mikado's Empire are settling down there in ever-increasing numbers is certainly very significant. Sugar-growing is the great attraction, and 30,000 Japanese are engaged in this industry alone, as against 6000 emigrants from China.

But it is especially in Korea we see the capabilities of the Japanese in their quest for adventure and wealth across the sea. In that little country of ten and a half millions of people, the Japanese have a Legation, a Consul-General, seven Consulates, and about eighty mercantile houses and trading stores. At most of the open ports they have also municipal councils of their own, chambers of commerce, clubs, and public hospitals, besides a number of chief and local bank offices, as the currency is for most part in Japanese notes and silver *yen*. The carrying trade also shows the extent to which the Japanese have established themselves in Korea. During 1899 the steamers which entered all Korean ports belonged to four nationalities, their total number being 1666, with an aggregate of 746,020 tons gross. The distribution under each flag was as follows: Japanese, 1159 steamers having a total capacity of 602,227 tons; Korean, 442 steamers of 88,589 tons; Russia, 61 steamers of 51,863 tons; German, 4 steamers of 3341 tons, but these four German steamers were run under charter from the Japanese. It will thus be seen that considerably over two-thirds of the entire shipping trade of Korea is in the firm grip of our friendly but very wide-awake allies in the Far East.

We return now to their own important colony of Formosa to see what further changes the Japanese have made for the comfort and good conduct of its inhabitants; and at the outset it should be remembered that, when they arrived in 1895, instead of being allowed to take quiet possession, they found the people everywhere up in arms against them,

and had literally to fight their way from north to south before anything like settled government could be established. Moreover, as the mountainous eastern half of the island affords a ready asylum to fugitives from justice, it has always been very difficult to deal with insurrectionary movements there, this accounting for the firm measures which had to be employed at the beginning of the Japanese occupation.

Immediately after some measure of peace had been restored, the executive sent out qualified experts to engage in survey work and to report on the resources of their newly ceded territory. At an early stage, periodicals were also started for receiving contributions from non-official scholars and explorers on the natural features, topography, products, and ethnology of the island. The materials thus brought in and now stored up in Government reports, monthly and fortnightly journals, and the daily newspapers published at Taihoku, Taichu, and Tainan, make up a far more valuable bibliography than anything which has been produced by Chinese and European writers on Formosa. Thus, the *Handbook of the Tokyo Geographical Society* is full of information, while the *Journal of the Formosan Association* maintains its high character in being a perfect storehouse of facts on everything relating to the island. There are also philological, folk-lore, law, and trade journals issued from the press at Taihoku.

Running contemporaneously with it, and as an outcome of all this work, a complete census of the population was taken in 1897, 800 miles of roads were made, and a tramway line laid down from Takow to Sin-tek. This was followed by construction of the main line of railway from Kelung to Takow, about one-half of which has already been opened for goods and passenger traffic. Three cables were also laid down, connecting Formosa with Japan, Foochow, and the Pescadores, and over the existing 1500 miles of telegraph and telephone wires immediate communication has been made possible with every important inland centre. The post-offices recently opened in Formosa number over a hundred, and letters can now be sent to any part of the empire for two cents each. Up till the close of 1899 one hundred and twenty-two Government educational institutions had been established, only nine of those being for Japanese, and one hundred and thirteen for natives. There are at present ten principal Government hospitals in the island, at which about 60,000 patients are treated gratuitously every year, while sanitary precautions and free vaccination have become so general that the danger from visitations like smallpox and plague has been very much reduced.

Furthermore, the Japanese are maintaining eleven lighthouses round Formosa and on the Pescadores; the one of the first order on North Island—not quite finished—being the most important, and occupying a lonely spot in the neighbourhood of which between twenty and thirty wrecks have taken place within the period of my own residence in Formosa. It should also be noted here that Government is at present providing for the upkeep of four meteorological stations in Formosa and one on the Pescadores. Those circular buildings were specially constructed for this purpose, and the skilled officials in charge have com-

plete sets of instruments for enabling them to make hourly reports as to the direction and velocity of the wind, rain, sunshine, earth-tremors, and all such phenomena.

In short, Japan has already spent about one hundred and fifty millions of *yen* in efforts to develop the resources of Formosa and add to the comfort of its inhabitants; and of this amount, only some fifty millions have been raised in the island itself from taxation and every other such source of income; although there is good reason to hope that dependence on the mother-country will not last very long, and that the revenue of Formosa will soon begin to exceed its expenditure.

I may add that, excluding the military, police, and official classes, the Japanese population of Formosa for three years stood as follows:— In 1897 there were 16,321 males and females in the island; in 1898 the number rose to 25,585; and in 1899 to 33,120,—22,392 of these being males, and 10,728 females. Of course, that region which includes the capital in Taihoku has relatively the largest number of Japanese residents, but the following analysis of those in the Tainan Prefecture alone may be interesting:—

Occupation.	Males.	Females.	Total.
Officials,	2462	591	3053
Missionaries and School teachers,	52	25	67
Farmers,	7	1	8
Merchants,	1039	1075	2114
Mechanics,	319	102	421
Labourers,	305	29	334
Miscellaneous,	702	497	1199
No Occupation,	3	97	103
Total,	4889	2407	7296

Before concluding my remarks, it will not be considered out of place to refer to another matter, because I think every one will admit that successful colonising is seen at most advantage when the people themselves willingly submit to the new authority, and when the change of circumstances has brought about a distinct improvement of the public morals.

And I quite admit that considerate care is needed in the application of our tests here; for Japan faced a big, complex question on coming to Formosa, and things among the large Chinese and aboriginal population there are still of necessity in a very transitory state since affairs were taken in hand only six years ago. Besides, the testimony of any outside Britisher under this head should not be given in forgetfulness of the evils which continue to flourish throughout his own highly favoured Empire.

As regards then the attitude of the Formosans towards their present

rulers, rather than bring forward any fragmentary evidence of my own, it may better serve the purpose for me to quote some sentences from the *North China Herald*, because that influential journal is one of the best informed and most impartial in the Far East. About three months ago its Tokyo correspondent wrote as follows:—"The Japanese have a little South Africa of their own at the present moment in Southern Formosa. The number of bandits in the field is not large, but as the small army of occupation has to keep intact its lines of communication throughout a large tract of difficult and almost unknown country, some reverses are sustained by the troops of the Mikado. The Tainan garrison undertook an important sweeping movement which concluded on the 17th of December. The party sustained a loss of one officer and seventeen men wounded among the armed police who supported the column. The loss of the bandits is said to have been about 230. But if the Japanese are evidently in grim earnest it cannot be denied that their antagonists do not exactly deserve to be tenderly dealt with. About thirty of the latter attacked a public school at Mantan last month and murdered the Japanese teacher as well as his wife and child.

"On the other hand, a Japanese expeditionary corps made a sudden attack at Wanbansho some time ago on a gang of bandits, about seventy in number, who were under the leadership of Shiu-iku, who might be described as a Formosan De Wet. More than half the rebels were killed, while the casualties on the Japanese side were three killed and eleven wounded, three of the wounded being officers. It seems that the Japanese did their level best to prevent this outbreak by concession, but this policy is a mistaken one where semi-barbarous people are concerned, and when the malcontents proceeded by way of a joke to murder Mr. Ichi-kawa, a Japanese Christian, who acted as a medium between them and the Japanese authorities, the latter thought it was high time to change their methods. Up to the present they have been too mild.

"Last year there occurred 469 outbreaks among the discontented natives in Formosa. The district that suffered most in this connection was the Tainan Prefecture with 243 uprisings, and it is followed by the Taichu and Taihoku Prefectures with 142 and 48 respectively, while the sub-Prefecture of Giran, representing 36, brings up the rear. Considering the condition of affairs which these figures reveal, it is not surprising that the Japanese Government is reluctant to extend to Formosa all the constitutional privileges enjoyed by Japanese in Japan proper. In fact, it has just introduced to the Diet a Bill for investing in the Governor-General of Formosa for three years further the privilege of issuing and enforcing Orders in Council that take the place of laws and regulations enacted in the regular manner. It may be remembered that this special delegation dates back six years, and that the prescribed term, already renewed once, is to expire at the end of next month—that is, last March."

Now, it appears to me that any word of criticism that might be offered on this statement of the Correspondent from Tokyo should be in the line of showing that, while disorder in Formosa undoubtedly exists, there is also a great amount of quietness, and even of willing subjection

to the powers that be. The condition of things is not unlike that which was seen in 1888, when the Chinese Governor, Liu Ming-chuan, tried to obtain funds for his reforming schemes by the imposition of a land-tax, but whose well-meant attempt so roused certain classes of the people, that a large military force and two gunboats had to be called into action. It may be as well also to remark that many of the above-mentioned 469 uprisings would be regarded amongst ourselves as being only very ordinary cases of highway robbery or housebreaking. I have myself no hesitation in giving it as my opinion that the industrious, the intelligent, and the more influential of the natives of Formosa are beginning to see that their bread is buttered on the Japanese side, so to speak. Some of the malcontents I have spoken to are "rebels" through sheer ignorance, while others are "agin the Government" because they dearly love adventure which keeps the pot boiling, and does not bind them down to any kind of daily honest occupation. I think the Japanese have no desire to use harsh, cruel measures with their Formosan fellow-subjects, and that the present opposition—being without any real justifying cause—will soon give place to quiet, if not even grateful, citizenship.

The other point on which I wished to make a remark or two refers to that influence which the arrival of the Japanese is having on public morals amongst the people of Formosa. Of course, some may say this is going a little further than I have any right to, but I have really no desire now to show how "Babylon the great is fallen, is fallen," or to express myself in any Pharisaic sort of way. I simply meant to enter a slight caveat against that style of representation which assumes material prosperity to be the *summum bonum* in all attempts at colonising, and looks on everything as going on famously if only imports, and exports, and income-tax returns keep steadily on the increase.

But if the tariff claims its percentage on such imports as opium, sake, courtesans, dancing-girls, singing-girls, and waitresses in houses of entertainment, it surely becomes more than interesting to inquire into the amount and real value of the income derived from such sources. And the reasonableness of this inquiry is seen in my foregoing statement about opium-smoking, as well as in the friendly criticism sometimes made that a *visibility*, if not even *attractiveness*, is now being given to loose living in the island, which cannot but lead to very evil results.

I should, however, be sorry to conclude these notes in any other than a hopeful spirit about the future of Formosa. Its resources are very abundant, and its affairs are now under the control of a most vigorous, intelligent race. I am glad also to remember that there are Japanese Christian churches at Taihoku and Tainan, while in remote country districts we sometimes meet with Japanese brethren who are not only rendering efficient service to the State, but are bravely trying to lead high-toned Christian lives.

THE INFLUENCE OF GEOGRAPHY ON THE DISTRIBUTION OF THE POPULATION OF SCOTLAND.[1]

By M. Paul Privat-Deschanel.

(*Translated from the French.*)

The following paper does not include the whole of the human geography of Scotland—so complicated and extensive a subject could not be adequately discussed within the limits of a magazine article. The intention of the writer is merely to pass in review some of those facts whose methodical grouping is the object of the two branches of Anthropogeography which the Germans call *Siedlungslehre* and *Poleographie*, and which consist in the geographical study of the density of the population and of the distribution and development of the towns. For such an investigation Scotland offers peculiar advantages. Not that the phenomena are more remarkable there than elsewhere, but they present themselves in a singularly well-defined manner. The contrasts are well marked; thus the density per kilometre varies according to the counties from 4 to 417. Types so well characterised make it easy to determine the effective causes.

As to the method to be employed, four orders of factors can be invoked as causes:—

(1) The distinctively *geographical* factors, those concerned with the position on the globe—the *Weltstellung*—of the regions considered.

(2) The *edaphic* factors, that is to say, the influence of the soil in all its forms.

(3) The *climatic* factors.

(4) The *human* factors (ethnic, social, historical, economic).

It might seem most natural to pass all those factors in review successively, discussing the effects of each in turn, but this method, which would only exhibit the action of one cause at a time, would fail to make manifest the complex nature of the facts of human geography. Besides, in geography no less than in physics one encounters the phenomena of *interference*—one of the acting causes masks the effect of another, and if the factors be considered separately, no account can be taken of this. The true method consists in studying the factors together, and, to that end, one must start with the *natural regions*, in which diverse and at times opposite causes result in similar effects. In this way we take our stand on the complex reality, and a single glance embraces both the effect and all the causes which have produced it. This is the method which we shall employ. We shall examine successively the three great

[1] This article originally appeared in the *Bulletin de la Société de Géographie de Lisbon*, but it has been thought that its point of view might render it of interest to Scottish readers. At the request of the author the figures have been altered (where possible) in accordance with the results of the census of 1901. In reading the paper, reference should be made to the Royal Scottish Geographical Society's *Atlas of Scotland*, 1895.

natural regions, so sharply defined, which all geographers agree in recognising in Scotland:—(1) The high land of the South, or *Southern Uplands*; (2) the high land of the North, or *Highlands*; (3) the low ground of the centre, or *Lowlands*.

I.

The *Southern Uplands*, with an area of 4185 square miles, contain 278,000 inhabitants, about 25 to the square kilometre. From these figures a very interesting conclusion may be drawn. The region, which is mountainous, is thinly peopled. On Bartholomew's map, where increasing density of population is indicated by more intense shades of red, the Southern Uplands form a clear spot between the denser tints of the Lowlands and of Northumberland, and the colour-change corresponds closely to the line of demarcation between plain and mountain. Nevertheless there is a relative concentration of the population in the Southern Uplands, for twenty-five per cent. of the inhabitants of Scotland occupy only fifteen per cent. of the country. This at first sight somewhat abnormal fact is explained by the proximity of England and the slow infiltration of the English. The English language in consequence largely predominates: less than five per cent. of the population speak Gaelic. The influence of geographical conditions is well seen in the inequality of distribution of this population.

The country is mountainous: numerous chains of hills, such as the Cheviots, Lowther hills, Moorfoots, Lammermoors, etc., extend in parallel lines, constituting the remnants of the great Caledonian chain, now in large part worn away. Further, the altitude is moderate, the Cheviots do not exceed 813 metres, and the culminating point of Southern Scotland, Mount Merrick in the Lowther hills, only reaches 845 metres. At this height in Germany, Austria, and Switzerland, important human settlements exist, but here the latitude (55°-56°) accentuates the effect of altitude. In combination with the abundance and continuity of precipitation, and the consequent humidity of the air, the latitude hinders cultivation, and gives up all the summits to barren heather and all the valleys to peat-bogs. Many districts are completely uninhabited, and constitute white spots upon the map. Man ascends only to a low elevation, for while in the Alps permanent habitations are found at a level of 2000 metres, and in many places even beyond this limit, in the Southern Uplands, Leadhills, the highest village of Great Britain, is not more than 450 metres. Towns have only been established at strategic points; they are the old fortresses of the Scottish frontier, of that Borderland, disputed for centuries between Scots and English. Such are Selkirk and Roxburgh, which have never emerged from their condition of large villages, in spite of their position as capitals of counties.

The only exits are at the extremities of the mountains. These constitute the two roadways along which military and economic invasions have alike taken place, and upon them the population forms dense strands. But the two roadways differ much in type. The eastern coast forms the easiest passage, and the one which has been longest

known; it is the great historic road between Scotland and England. It profits also from those fertile plains which the eastward-draining streams have multiplied in Scotland on the borders of the North Sea, plains which are wanting on the Atlantic seaboard. On these plains immigrants have established themselves, so that the population, in which English immigrants dominate, has attained round Berwick, North Berwick, Eyemouth, and Dunbar a density per kilometre of 100.

Another fact worthy of note is the consequence of the convex curve towards the East which the Scottish coast takes. It has been necessary to shorten the road towards the fertile and populous Lowlands by cutting across the mountains. From this fact has arisen the importance and peopling of the road which, setting out from Berwick, leads directly to Edinburgh and Glasgow. Along this road, which mounts the narrow valley of the Tweed, agriculture has been impossible; but industry, favoured by the proximity of the coalfields of the Lowlands, has established itself. All the towns are industrial in type. Centres of recent origin, such as Galashiels and Hawick, have already respectively 12,804 and 17,303 inhabitants owing to the textile industry. Berwick, alike a station on the coast route and the terminus of the mountain route, has naturally become the metropolis and the most populous town of the region.

On the western side, the mountains descend to the seaboard, which is even more convex than at the east. There is thus no commercial route established along the coast, which would be deserted were it not for the vicinity of Ireland. Port-Patrick and Stranraer are the points at which land the numbers of Irish who come to Scotland, either as temporary emigrants at harvest time, or with the intention of establishing themselves permanently in the country. Of these latter emigrants there are to-day more than 200,000 in Scotland; on the side which faces Ireland they represent ten per cent. of the population.

The routes—much frequented and densely populated—which constitute the shortest road between England and the Lowlands cut across the mountains and utilise the parallel valleys of the Annan, the Dee, and the Nith. By this route passes the railway from London to Glasgow. At the extremity of these valleys, the ports of Annan, of Kirkcudbright, and Dumfries (18,148) constitute points of entry and exit for merchandise. In addition, their southern exposure and their situation at the foot of mountains which shelter them from the cold and damp winds has rendered them towns of baths—the district is the *Midi* of Scotland.

II.

As a whole the *Highlands* are very sparsely populated. Their 17,500 square miles include only 776,000 inhabitants, that is 15 to the kilometre; one-tenth only of the Scottish population inhabits six-tenths of the territory. This population, in addition, is very unequally distributed. We shall therefore need to examine successively the three natural sub-regions of the Highlands, the mountains of the West with the archipelago of the Hebrides, the plains of the East, and finally the islands of the North—Orkney and Shetland.

The mountains have been peopled by the conquered Celts who have found a refuge there, at first against armed invasion, and later against the slow immigration of foreigners. They constitute a Celtic island in the Anglo-Saxon ocean. There are still 250,000 Gaelic-speaking Highlanders.

But if the peopling of the region has been historically necessary, the high lands of the West being a true Land's End, yet the geographical conditions have rendered the life of the people exceedingly precarious. The mountains, consisting of the Grampians and the Northern Highlands, are the remnants of the Caledonian chain. If, owing to long-continued erosion, their elevation is mediocre (Ben Nevis, the culminating point, is 1343 metres), their disposition in long parallel chains, rectilinear and continuous, renders communication between the *glens*, or longitudinal valleys enclosed by the chains, almost impossible. Their crystalline rocks yield only unfertile soil. To these inconveniences must be added those resulting from the latitude (56 -59), and from the humidity—the rainfall at the centre is 1 metre to 1 metre 50, and increases towards the West (Glencoe 3 metres 26). In consequence, there are vast peat-bogs and tarns, or shallow sheets of water, which together with the tectonic lochs diminish considerably the available surface. Add to this a situation geographically disastrous, beyond all commercial routes, faced by a deserted ocean, bounded by an iron coast with abrupt cliffs and innumerable rocks, perpetually beaten upon by the strong west winds.

Naturally sparsely populated, the mountains of Scotland have been still further depopulated by the action of a combination of historical and social conditions.

In the first place, the system of land-ownership has been pernicious. From the clan system there has resulted immense domains: thus one-third of the country belongs to twenty-one proprietors, half to seventy, nine-tenths to seventeen hundred. A single individual possesses the island of Lewis, the largest of the Hebrides. There are even some formidable properties which recall the sovereignties of feudal times. Thus the *kingdom* of Sutherland comprises not less than 530,000 hectares, that is one-fifteenth of Scotland. Nothing shows better than Sutherland how unfavourable this rental system is to the exploitation of the soil, and consequently to density of population. Of these 530,000 hectares, only 11,000 are cultivated, and the mean product per hectare does not exceed 3 francs, while the mean product per hectare in free cultivation is 125 francs. In consequence, Sutherland is the least populous county of Scotland; it has not more than four inhabitants per kilometre.

If the system of land-ownership has had what may be called a passively adverse effect upon the population, man has exercised a direct action on the depeopling. In addition to the destruction of the forests, once very active, there has been a continued and intentional effort to replace inhabited land by game-preserves. Scotland abounds in *gibier de luxe*, such as deer and grouse; indeed not long ago the aurochs was also found. Little by little the game-preserves have been extended, and in Scotland, by a strange reversal of the ordinary course of civilisation,

man is retreating before the deer. There are to-day at least 800,000 hectares reserved exclusively for sport. In order to reach this figure, systematic depeopling has had to take place. Repeatedly there have been expulsions *en masse*. Between 1811 and 1820 the Duchess of Stafford drove 15,000 persons from her estates. Sometimes in order to facilitate the operation, cabins and even entire villages were burnt. In a single night 300 houses, representing four parishes, were thus consumed. Even since 1850 more than 400,000 hectares have been thus depopulated. The islands of Rum and of Barra are to-day deserts.

Similar practices have resulted in augmenting emigration—already considerable owing to the poverty of the country—to vast proportions. From all Scotland the emigrants in 1901 numbered 20,954 persons of Scottish birth. The average number between 1853 and 1900 was 19,800. The tide of emigration sets towards the Lowlands, towards England, where the Scotsman is well known in commerce, and towards Canada and Australia, where great facilities are accorded to Scottish emigrants.

The combination of the above causes—geographical and human—have made the eastern part of the Highlands an almost deserted country. Several regions are entirely uninhabited, and in all the mountain region there is not a single town.

Nevertheless, three bands of population cross the high ground, one along the western coast, a second following the Caledonian Canal, and a third stretching in a straight line from Perth to Inverness. The existence of the first band is explained by the presence of a population of fishers—for the sea is richer than the land. Fish and Crustaceans abound in the rocky creeks of the shore, and the salmon in the streams. The sale of salmon in Scotland amounts annually to 100 millions of francs.

The Caledonian Canal follows the Great Glen, or Glenmore, which traverses Scotland in the direction of the orogenic folds. This is a very ancient surface peculiarity, for some Jurassic and even Triassic remnants show that it was at least outlined before Secondary times. It consists of a depression, a rectilinear fissure 160 kilometres in length, whose most elevated point does not exceed 30 metres. In this depressed zone there have been established some elongated lochs—Loch Lochy and Loch Ness—which form a true chain. It was sufficient to place these in communication by an easily constructed canal in order to produce a fine navigable channel. This is the Caledonian Canal, projected by Watt so early as 1773, and opened in 1843. As it is the most direct route between Glasgow and Inverness, it has become the channel of commerce. Tourists have also appeared, and to-day one sees this privileged corner of the Highlands animated by steamboats during the summer months.

Finally, a densely populated tract extends between Perth and Inverness. This is a short-cut, analogous to that noted above in the Southern Uplands which utilises the valley of the Tweed in order to put Berwick in communication with Edinburgh on the one hand and Glasgow on the other. In this case also one notices the effect of the bulging outward of the Scottish coast. The road which borders the sea is too long, and it has been shortened by cutting through the mountains.

This road is naturally beset by a fair number of villages, connected by the railway from Perth to Inverness.

In the eastern part of the Highlands is concentrated by far the greater part of the population. In the first place the faulting of Scotland so early as the Primary epoch has permitted the establishing of marine inlets, the horizontal deposits of which have been the origin of the plains of Caithness, Moray, and Aberdeen. These plains were later extended owing to the movements of elevation and depression in Scotland during the Tertiary period. The western coast is rocky, and the glaciers, fed by the abundant humidity, were there of long duration. On the other hand, on the low-lying eastern coast the glaciers, protected against the rain-bearing winds, early disappeared. In consequence of the general slope of the land, all the drainage flows to this seaboard, and the abundant alluvium has at the same time levelled and fertilised the soil. The glacial clay or till, which corresponds to the boulder-clay of the English, abounds there. The soil is fertile, so that while during the eighteenth century there was only a single field of corn in the whole of Scotland, situated near Edinburgh, now wheat is cultivated along the Moray Firth in latitude 58°. This is the primary cause of the existence of the population, but it is chiefly the sea which has created the prosperity of the country. The seaboard, well sheltered from the west wind, and rich in natural ports, gives upon an active and *populous* ocean, bordered by commercial countries—it faces civilised Europe. Since the Middle Ages the North Sea has been a true *Mediterranean*, around which the Scandinavian countries, the towns of the German Hanseatic League, and the Netherlands formed a counterpoise to England and Scotland. Again the sea is rich in itself, for the herring swarms there. It also borders upon the Norwegian Sea and the Arctic Ocean, where both seal and whale fishing are carried on. A whole group of ports, Aberdeen, Peterhead, Fraserburgh, Banff, Buckie, Macduff, fit out for pelagic and local fishing 3000 boats, with a tonnage of 30,000 tons, and carrying 25,000 hands.

The influence of these important natural advantages makes itself felt in the density of the population. The plain which stretches from Aberdeen to Banff has 30 to 50 persons per kilometre—a very respectable figure for the Highlands. Around Aberdeen the kilometric density rise to 80. There are many aggregations of 5000 inhabitants. Peterhead has about 12,000 and Inverness 21,193. Inverness, a fine port at the extremity of the Caledonian Canal, would have attained great importance were it not for its latitude (58°) and the fact that it opens upon little frequented waters.

There is even one large town, that of Aberdeen. It is the gateway of entrance and exit for northern Scotland, the port where food-stuffs and manufactured goods are imported, and granite, slate, and Scottish salmon are exported. The town fits out 3000 vessels, and builds annually 6000 tons. In consequence the population has risen to 143,722 souls.

The islands of the North—the Orkney and Shetland Islands—belong at the same time to both the other regions of the Highlands. In their

conditions of climate and soil they recall the mountains, but their insular position has made them participate in the maritime life of the eastern coast. Of the thousands of islets, 788 are recognised administratively, and only 186 are inhabited; 160,000 persons are distributed over an area of 9600 square kilometres, which gives a rate of 17 per kilometre. The interior of the islands is too wet and too mountainous to permit of the cultivation of either cereals or vegetables. The population is exclusively settled on the seaboard, and consists of fishermen only. The ports of Kirkwall (Orkney) and Lerwick (Shetland), the rendezvous of the herring-fishers, are in summer time very animated. Nevertheless they are now much less so than in the seventeenth century in the great days of Vlaardingen and Maasluis, when 2000 *buss* or *doggers* were sometimes to be seen in the roadstead of Lerwick.

III.

The *Lowlands* have 8100 square miles and 2,963,000 inhabitants, giving an average of 130 persons per kilometre, almost double the average of France (72). Within 30 per cent. of the Scottish territory are included 65 per cent. of the population. This excess is the result of a remarkable combination of favourable natural conditions.

The country is a plain with a rich subsoil and a fertile soil. Fractured from the Caledonian chain, the Lowlands formed a strait in which the seas of Devonian and Carboniferous times deposited together with an enormous accumulation of coal, horizontal beds of grit and friable schist, and, as well as being destined by their origin to form a flat country, have been still further planed down by prolonged erosion. The line of separation between the Atlantic slope and the slope to the North Sea is depressed to 47 metres, and the only points which exceed 100 metres are some isolated ranges of hills sloping NE., such as the Stirling hills, the Ochils, and Sidlaws, which have been protected from erosion by the hardness of their eruptive rocks and have remained elevated, as witnesses of its former state, in the midst of the total flattening of the country. The soft rocks in decomposing have yielded good arable land, still fertilised by glacial streams. Within the shelter of mountains which protect them at the same time from the cold and from the rainy winds, the great plains of Strathclyde and Strathmore are covered by fields of cereals and vegetables; for a century wheat cultivation has been widely spread there. The population here attains to 100 persons per kilometre.

It is in these fertile and populous plains that historical Scotland has grown up, first around Perth, and later around Edinburgh. Here numerous towns are clustered: Stirling, the guardian of the road from the Highlands; St. Andrews, the old national University, founded in 1411; Forfar, Clackmannan, Linlithgow, and so on. These historical towns still bear the marks of their picturesque past in their antique monuments, whether religious or municipal, and in their feudal fortresses planted on the summits of abrupt hills. Since the foundation of its University in 1582, Edinburgh has remained the intellectual centre of Scotland. It has always been a town of arts, of letters, and of science—the Athens of the North.

But the old Scotland is moribund. The reasons which produced its greatness have in our days lost all their efficacy. The national spirit has fled to the mountains, and the modern world, in the English form, has conquered the country, producing on account of new needs, new groupings. St. Andrews, Clackmannan, Linlithgow are now dead towns; Perth, the great port of the Middle Ages when large vessels did not exceed a tonnage of 100 tons, would have perished, if, as at Forfar, new industries had not reanimated its languishing life. Even Edinburgh owes its 316,479 inhabitants less to its historic past than to the industry and commerce born yesterday—its suburb of Dalkeith(?), where are crowded the elegant villas of merchants, is the visible sign of this transformation. Industry and commerce have given birth to a new Scotland, built upon the ruins of the old, and have transformed the demographic type of the country. A great maritime region has been developed on the east; a great industrial region, originating on the western seaboard, has overflowed to the eastern side.

We have already noticed the beneficent influence of the North Sea, the Anglo-German Mediterranean; it is here above all that it makes itself felt. The coast is propitious, sheltered from the stormy west winds, rich in natural ports, penetrated by those incomparable inlets, the Firths of Forth and Tay. The reputation of the sailors of this district is widespread. The ports carry on alike a coasting trade and oceanic commerce, local and pelagic fishing; they possess 10,000 ships, with a gross tonnage of 2,500,000, and put upon the sea 25,000 tons per annum. The coast of the inlets is fringed by towns and large boroughs; the density of the population attains to 150.

Commerce has brought in its train industries which have been rapidly developed by means of the coal. The flax and hemp of England, the cotton of the United States, the jute of India are manufactured at Dysart (15,256), Montrose (12,401), Arbroath (22,372), Kirkcaldy (34,064), at the old reviving towns of Forfar (11,397), Perth (32,872), and above all at Dundee (160,871), which has made a specialty of commerce with India and of jute-weaving. But it is above all along the Forth in the vicinity of Edinburgh, and at the outlet of the great commercial route from Glasgow that densely populated communities congregate; Leith, Prestonpans, Musselburgh, Granton, and Portobello, now all continuous, form a centre of more than 100,000 inhabitants, a great commercial city divided into several administrative towns.

The industrial region which has been developed round Glasgow, but which has ended by swallowing up even the district of Edinburgh and overflowing over historic Scotland, is, above all, the product of the coal-fields. From the Scottish basin are extracted yearly more than 20,000,000 tons of coal, that is, two-thirds of the French production. Iron is equally abundant. Metallurgy is in an advanced state, and as usual there follows in its train such industries as weaving and cloth-making; these again, owing to the increasingly active relations with America, have undergone a continuous and regular growth. To-day the region

is the most important manufacturing district in the British Isles outside Yorkshire.

The geographical history of Glasgow, by turns cause and effect in the growth and industrial and commercial prosperity of the country, is extremely instructive. This great city is the result of the human will directed by geographical influences.

The local conditions until the seventeenth century were extremely unfavourable. The Clyde, scarcely 120 metres wide, was only navigable for barques; the North Atlantic was a desert, and all the commerce was carried on by the eastern coast with Germany, the Scandinavian countries, Flanders, and France. Glasgow did not seem likely to survive. Greenock, which is nearer to the sea, appeared to be the town of the future, and indeed for a long period the fortunes of the two towns were much the same. The inhabitants of Glasgow even went so far as to discuss the question of abandoning their town, and making a new settlement at Dumbarton. Glasgow was only saved by the refusal of that town. Glasgow also developed very slowly; it has been exactly the opposite of the American "mushroom-towns." It was the commerce with America which began its upward progress. In 1718 for the first time a ship brought tobacco from Virginia and Maryland. Later cotton replaced tobacco, and established the textile industry in the country, where the exploitation of coal had already been begun on the large scale, together with the extraction of iron and its metallurgy. But it was above all the tenacity of the inhabitants which definitively assured their success. They have depended entirely upon themselves, and for two hundred years have battled unceasingly against their river. In 1662 they excavated the docks of Port-Glasgow; on their own initiative the riverside towns banded themselves together for the improvement of the Clyde. With a part of these works the names of Smeaton and Watt are associated. In 1875 the channel had a depth of seven metres at low water.

To-day Glasgow, with its 735,906 inhabitants, is, after London, the most populous town of the United Kingdom; three thousand works give employment to 120,000 workmen. The port extends over 32 kilometres, and the town, obliged to follow it, is slowly descending the course of the Clyde, so that the cathedral, which marked the centre of the mediæval city, is nowadays in the suburbs. Glasgow annually receives 30,000 ships, carrying a gross tonnage of 70,000 tons; she constructs 280,000 tons, one-third of the total production of the United Kingdom, more than nine-tenths of the total Scottish production.

Glasgow has exercised the usual attraction of large industrial towns. Its action has radiated outwards, following the eight lines of rail which form a star around the city, and numerous centres have arisen, grouped in a natural district, of which Glasgow is, as it were, the capital. There is thus a *geographical Glasgow* surrounding the administrative Glasgow: twenty industrial towns with more than 10,000 inhabitants encircle it, daughter-cities grouped round their mother, constituting an imposing centre of population. The enumeration of these produces by its monotony a striking effect: Irvine, Troon, Dalry,

Ardrossan, Renfrew, Clydebank, Pollokshaws, Kirkintilloch, which have all from 10,000 to 12,000 inhabitants; Rutherglen (16,185), Port-Glasgow (16,840), Govan (76,351), Wishaw (20,869), Dumbarton (19,864), Airdrie (22,288), Ayr (28,624), Hamilton (32,775), Kilmarnock (34,161), Coatbridge (36,981), Greenock (67,645), Paisley (79,355).

Outside these industrial centres there are round about Glasgow quite a group of towns of a different type, such as are the habitual satellites of great cities. These are, in the first place, towns with baths, watering-places, and pleasure resorts, such as Helensburgh on the lower Clyde and Rothesay in the island of Bute. Then there are also *avant-ports*, always frequent in estuaries, such as Dumbarton, the gateway of the western Highlands; Port-Glasgow and Greenock, where the large boats stop; Lamlash, in the island of Arran, where sailing-vessels wait for favourable winds, whose roadstead sometimes contains 70 to 80 vessels at a time.

Glasgow has even radiated over the Lowlands of the east, over the geographical domain of Edinburgh. This expansion, this progress towards the East, has been favoured by the easiness of the passage from the estuary of the Clyde to the Firth of Forth. The two seaboards have been made to communicate with one another by a canal which does not rise more than 47 metres. Along the whole length of this canal and at its opening towards Edinburgh and Stirling, there are centres containing 10,000 to 30,000 inhabitants where coal and iron are worked, or where cloth is woven, which are really suburbs quite outside *greater Glasgow*; such are Alloa, Dunfermline, Bo'ness, and Grangemouth. It is with truth that Grangemouth has been called the port of Glasgow on the Forth.

All these details enable one to understand the enormous crowd of human beings contained within industrial Scotland. The demographic type of this region is also quite peculiar, and is strongly contrasted with that of agricultural Scotland. The four counties of Dumbarton, Renfrew, Lanark, and Ayr do not contain less than 1,976,529 inhabitants, one-third of the population of Scotland, and the kilometric density of the county of Lanark amounts to 581, a truly Chinese density, the towns according to the English method being computed separately. In addition one is struck by the number of urban centres of industry, and by the fact that they include by far the greater part of the population. The relation of the urban population to the rural is about two-thirds.

The interest of this study is that it shows that the population of a country is irregularly distributed according to natural conditions; that is to say, according to geographical conditions. It exhibits in a luminous fashion certain general laws already well known, but here made manifest in a particularly expressive fashion, because Scotland is a country which presents extremes.

It is sometimes said that civilised man escapes from the tyrannical domination of nature, while savage man is the slave of his environment. But the study of the geographical demography of Scotland

suffices to demonstrate the exaggeration involved in this theory. Even in the semi-artificial region of industrial Scotland we have seen that if man modifies the details of his environment it is only while continuing to respect its main features. This is the main geographical fact. The general conclusion, then, is that anthropo-geographical investigations show that in this domain, as elsewhere, man only commands nature by obeying her.

THE ORIGIN AND DEVELOPMENT OF HEATHER MOORLAND.

By Dr. W. G. Smith.

An important contribution on regional botanical survey has recently been published in a monograph on the Moorland Heaths of North-West Germany by Dr. Paul Graebner.[1] As the author has been unable to give special attention to recent work in Britain, a comparative review seems not unnecessary. The moors of Northern Germany have been examined by Graebner for the past ten years, and his earlier papers were used as references in preparing the scheme of botanical survey suggested by the late Robert Smith.[2] Dr. Graebner's latest work finds a fitting place in the series of monographs on the vegetation of the earth issued by Professors Engler and Drude. In our opinion it ranks amongst the best of these.

From the point of view of botanical survey, the vegetation of the uncultivated moorland has a special interest, for there the influence of man is least apparent, and the natural agencies of soil and air exert their influence on plant-growth with least disturbance. The various types of moorland, where the dominant vegetation consists of heather (*Calluna*), with a well-marked set of associated species, are so characteristic in Northern Europe and the mountainous parts of Europe generally, that they form an ever-present problem. The list of papers quoted by Graebner extends to twelve pages, and is evidence of the interest taken by the plant-geographer in the distribution of heather vegetation, and by the biologist in the exquisite adaptations to environment presented by *Calluna*, *Erica*, *Vaccinium*, and other associates.

The area of Dr. Graebner's observations—the North German plain—has been compared to "an old Frisian mantle, made of coarse sackcloth, but fringed with silk"; the silk fringe is the grassy pastures of the Dutch and Frisian cattle country, the sackcloth is the barren heath of

[1] *Die Vegetation der Erde*, edited by Engler and Drude: vol. v. *Die Heide Norddeutschlands*, by Dr. Paul Graebner. Reviews of the preceding volumes have already appeared in this magazine.

[2] Smith, Robert, *Botanical Survey of Scotland*: I. Edinburgh district: II. Northern Perthshire. John Bartholomew and Co., Edinburgh, 1900.—Also *Scot. Geog. Mag.*, July and August 1900.

the hinterland. The plain extends from the shore of the North Sea and Baltic southwards to the base of the Weserberg, Harz, Erzgebirge, Isergebirge, and other hills which form the northern fringe of the South German plateau. The plain as a whole is a uniform area of rolling land of no great elevation, yet Graebner's map shows that the "Heidegebiete" is definitely concentrated into certain portions of the plain. The chief mass lies in Hanover, Oldenburg, and Schleswig-Holstein, and extends from the Zuider See pastures eastward; the southern edge includes the upper part of the Vecht, passing along the base of the Weserberg to the cities of Hanover and Brunswick, whence the eastern boundary passes almost directly north to Lubeck and Kiel Bay. Along the Baltic there is a narrow coast-zone to Dantzic Bay and the mouth of the Memel. An isolated but well-defined area lies in Lausitz on the north-east frontier of Saxony, partly in Brandenburg and partly in Silesia. Another outlier, with a less marked "Heide" character, lies in Mecklenburg in the Elde valley, between Schwerin and the River Elbe. The "Heide" area thus indicated is the source of most of the examples quoted by Graebner, but his general conclusions and the questions raised by them may equally well be discussed from examples nearer home. Our material is provided by the papers and maps already published by R. Smith, his notes for future work, and other information collected by us. At present we are not in a position to discuss the heath vegetation of southern moors, such as Exmoor and Dartmoor, because these have not been worked over (to our knowledge) in the light of recent developments.

The moorlands of Scotland and the north of England, up to 2000 feet, may be conveniently described as dark or black moors and green moors. The former is dark, partly from the soil which is more or less peaty, and partly from the sombre aspect of the vegetation, which consists of heather (*Calluna*), heaths (*Erica*), and other associates of the heather vegetation. The green moors and hills have a vegetation chiefly composed of grasses. The distinction is convenient, but it is also indicative of differences in soil and other external factors which influence the growth of plants; thus heather-moor, grass-moor, and forest are three primary types of vegetation considered from a biological standpoint. The term "Heide," used by Graebner, refers to the heather vegetation, and he defines it thus:—"An area covered by a dwarf, woody vegetation, where trees are not a conspicuous element, and where continuous swards of grass are absent." The word "Heide" is here given a scope somewhat more comprehensive than most writers allow; it corresponds to our dark moor or heather moorland in its widest sense. Such a moorland is recognised not by the occurrence of any one plant—although heather, bell-heaths, or cotton-grass (*Eriophorum*) are generally present—but by the nature of the whole association of plants. Lists of species are unnecessary for our present purpose: they are given in the text accompanying the published maps of the Scottish Botanical Survey, and Graebner (pp. 35-58) gives lists of species which inhabit his "Heidegebiete," and which occur off it respectively. The heather moorland, although a well-marked type of vegetation, includes a number of subtypes indicative of some change in the environment—for instance, wet,

moist, and dry places differ in their species and in the relative frequency of the species found on them. In the maps of the Scottish Survey two subdivisions of heather vegetation are shown by distinctive colours: the drier moors with a moderate depth of peat, and heather (*Calluna*) as the most abundant species, are distinguished from the wet bog of deep peat where heather is largely replaced by cotton-grass or bell-heath. Heath plants also find a subordinate place in the mixture of grasses and heather recorded on the maps; here the heather has been more or less suppressed by grazing or other causes, while *Nardus*, *Aira*, and other grasses have been favoured; the result is a vegetation with a strong admixture of heath plants, yet presenting a transition to the pure grassy type; these we distinguish as grass-heaths. The presence of heath-plants in some of the forest associations affords an example of transition from pure heath or moor to the forest type.

Graebner's work thus falls naturally into two parts. The first deals with heather vegetation generally, the conditions of its existence, its relation to climate, and its development. The second part is more botanical, and deals with the subdivisions of the heather formation. In the present paper we shall consider principally the general part of Graebner's work, because his observations and suggestions, while valuable to the botanist, are no less instructive to the geographer and meteorologist.

Conditions necessary for Development of Heather Moorland.

(1) *Altitude.*—One is liable, on first thoughts, to connect heather with hills, but more careful consideration may recall the fact that in Britain we have, especially on the East Coast, considerable heaths a few feet above sea-level. The maps of the botanical survey show that heather may occur at all elevations up to 2000 feet, and even higher, although there it is more frequently found that bilberry (*Vaccinium myrtillus*) assumes the place of dominant plant. On the other hand, the map prepared by Graebner shows that the "Heidegebiete" of the North-German plain exists only in the western or North Sea region, while it disappears in the eastern inland steppe region. Altitude in itself has thus no direct effect on the distribution of heather moorland, and is only of importance when considered along with other factors.

(2) *Climate.*—Northern Germany presents an excellent opportunity for observing the effects of climate on the distribution of heaths and moors. Graebner has collected meteorological observations for his area, the general facts of which are also shown in the charts in Bartholomew's *Physical Atlas*. The area of least rainfall lies in the Oder-Weichsel basin, many parts of which do not attain 50 cm. (20 inches) per annum. Towards the Baltic there is an increase to 62-70 cm., except near the estuaries of the Oder and Weichsel; it is noteworthy that we have a Baltic "Heide" zone unbroken except in the neighbourhood of the same estuaries. Passing southwards from the Oder-Warthe basin the rainfall increases towards the Lausitz "Heide" area, where it again reaches 60-73 cm. per annum. The chief "Heidegebiete" west of the Elbe, and

extending north into Holstein, shows a rainfall lowest (60 cm.) in Luneburg in the south-east, and increasing towards the North Sea coast to 60-70 cm. per annum. It is also shown that in the "Heide" area the average number of days with rain is 170 per annum, while on the plain outside this area it varies from 130 to 150 days. The monthly rainfall is greatest in the "Heide" area in these months when the greatest drought prevails in the area outside it. In regard to temperature, the "Heide" area is shown to have fewer hot days (maximum, in shade, 25° C. or more), fewer frost-days (minimum, in shade, under 0° C.), and fewer ice-days (maximum, in shade, under 0° C.). The "Heide" area, in short, is distinguished from the more eastern Steppe region by a moister climate, without long droughts, cooler in summer, and less intensely cold in winter.

Graebner further contrasts the two areas as follows (p. 60):—

(1) The soils of the North German plain are the same in the east and the west: sandy districts occur in both areas. (2) The vegetation is quite different: in the west there are extensive heaths, with heather-bog in the moister parts; in the east meagre pinewoods, dry sand-plains and knolls, with a steppe vegetation, while the wet parts are generally swamps (Wiesenmoor). (3) The two types of vegetation inhabit distinct areas (the "Heidegebiete" has already been indicated, and boundary lines of selected species are shown on the map). (4) In North Germany a large number of species inhabit the heath area which in the east are rare or absent. (5) A still larger number of species inhabit the eastern and midland parts of North Germany which are completely absent in the western area.

If we apply these climatic factors to Britain, it will be found that wherever heather and its associates are dominant the same conditions prevail: there is a considerable and constant quantity of rain or aqueous vapour, long periods of drought occur rarely, the average summer temperature is low, while the winter is variable, and icebound conditions do not last long. On the other hand, it would be wrong at once to assume that given these conditions of climate the vegetation should be heather. This is not the case. In Britain we have areas where the hills for miles are "green hills" and heather is conspicuously absent. In the published map of Northern Perthshire the Ben Lawers region stands out in sharp contrast to the surrounding typical heather area. In the Craven dales of Yorkshire it is the rule to find the valley slopes grassy and without heather for miles, while the plateaus and peaks of the watersheds are clad with a vegetation identical with some of Graebner's "Heide." Both the districts just mentioned have a very high rainfall which in the grassy area is not appreciably lower than in the heather area.

(3) *Soil-Conditions.*—Graebner (p. 114) states that the chief essentials for a dominant vegetation of heather and its associates are uniformly moist atmospheric conditions and a soil poor in plant-food. R. Smith says:—"The conditions of development of the heather association, shortly stated, seem to be the presence of a peaty soil poor in mineral content, which may be dry and unretentive, or wet and stagnant." On comparing the two summaries it is apparent that the worker on the

extensive North German plain gives precedence to abundant atmospheric moisture, a factor which the restricted area of Britain does not reveal. Both agree that the soils are poor, while R. Smith, from British and Norwegian experience, gives peat an important place. From Graebner's evidence it seems to us that the prime essential for a heather vegetation is a constant and abundant atmospheric moisture. The poor soil characteristic of heather moorlands follows as a result of the climate. Graebner attempts to demonstrate the poverty of the soil by chemical analysis, especially those made by Ramann. An interesting comparison is given of the soils of heaths and adjacent forests, also between heath-soils and adjacent grass-soils. These support the view that heaths occupy the poorer soils, but as at present chemical analysis is a doubtful guide in showing the true available food-materials for plants, it is desirable to obtain other evidence. It is characteristic of all heath-plants that the annual growth in length and weight is small, an indication that this vegetation is meagre in its requirements. A rich soil carries a vegetation with a large annual increment. In farm cultivation it is well known that the crops should follow in rotation, while loss by removal of crop must be made up by manuring. In meadow, wood, or garden it may be observed that plants of large growth change their position, the young shoots seeking out fresh soil which has not been exhausted by parent plants. When the vegetation of an area is dwarfed and slow in growth it is less migratory and better suited to occupy the same land for long periods. This is the case on heaths and heather-moors. It is not the result of immortality of the heath-plants, since heather, for example, dies out after ten to fifteen years' growth, yet the heath is repopulated again and again with it. The intrusion of heath-plants on an abandoned farm is also evidence that although the land has become too poor to support plants of large growth, it is still fit for the dwarf moor vegetation. A similar replacement of forest by heath will be considered later.

Do the heath-plants prefer a poor soil, or are they driven to it by rival forms of vegetation? An interesting solution of this question is given by Graebner. He states (p. 143) that if a heather area be manured the characteristic vegetation disappears. That this is not entirely due to successful competition of other plants is shown by cultivating heath-plants under conditions of rich nutrition. A slight excess in food results in enlarged growth, more foliage, and less flower; the critical periods of drought and winter are, however, less successfully met, and the plants tend to die off. Large excess of food produces premature leaf-fall, defective root-growth, and an early death. These effects are probably due to the small leaf area of *Ericaceæ* and other heath-plants, which renders the utilisation of food-materials slow, and favours the accumulation of unassimilated materials in the plant. The manuring of land by sheep would thus partly account for the development of grass-moor from heather-moor so often observed in enclosed areas, though here the grazing and treading of the sheep also tend to eradicate the heath-plants and to promote the growth of grasses.

The view that heather and its associates occur on poor soil is supported in a general way when the geological survey maps are compared with the

vegetation maps of Britain. Rocks which on weathering yield a poor soil generally bear some form of heath vegetation or pine forest, while over rocks producing a rich soil we find farm-land, deciduous forest, or good grazing moors. The ordinary geological maps are not, however, soil maps, hence where a good soil might be anticipated from the nature of the underlying rock, it is not uncommon to find vegetation of a heath character. Poverty of soil may result from various causes, of which we give the more important:—

(1) Natural poverty due to derivation from a poor rock.
(2) Exhaustion of soil by water.
(3) Exhaustion of soil by vegetation.
(4) The presence of glacial or river deposits.
(5) The formation of peat, humus, and other deposits.
(6) Human agency.

The discussion of these in detail would take us beyond our present limits, but the necessity of distinguishing them will be apparent if, with Graebner, we trace the development of some of the common forms of heather moorland.

Development of Heaths on Bare Sand.—At the present day, this can only be traced on recently deposited sand, but the course of events may also be taken as an indication of what occurred on the sands deposited at the close of the European glacial period. In North Germany there are considerable areas of recent and glacial sands. In Britain the frequent presence of heather and other heath plants on sandy soils must be familiar to most readers. In the course of the Scottish work, the vegetation of sandy areas has frequently been examined. Sand recently deposited, after prolonged exposure to water, must be very deficient in soluble plant food, and several changes are necessary before such a soil becomes covered with vegetation. The first step towards a heath vegetation is the consolidation of the loose drifting sand and the provision of soil-moisture. On a coast area like that north and south of the Tay estuary, the sands from high-water limit and inland for some distance form loose sandy dunes arranged in ridges and intervening hollows approximately parallel to the coast-line. The vegetation is scanty, and consists of sand-binding grasses and salt-loving plants, but heather and its associates are entirely absent. Away from the sea, the dunes become less shifting and the sand consolidates. This is especially the case in the hollows where rain-water forms occasional pools, and fine dust and organic matter collects. The catch-water has as its first vegetation evanescent growths of slimy blue-green and green algæ, which aid in consolidating the bottom and add to the organic matter, till the soil is impervious enough to retain water throughout the winter and spring. Pools of this kind soon prepare a substratum moist enough for certain mosses, the forerunners of the heather vegetation. Thus proceeds the production of a somewhat peaty soil, with a supply of moisture, scanty, but fairly constant. In time, the pink bell heath (*Erica tetralix*), dwarf willows, mosses, and other moisture-loving associates of the heath vegetation establish themselves in the hollows, while heather (*Calluna*), with other associates, clothe the ridge slopes more liable to short periods

of drought. Simultaneously with the above changes, the dune-ridges are levelled by wind and rain, in many cases assisted by the excavation of rabbits; the dune-grasses are replaced by low sward-forming grasses which accompany the heath plants in this association. Whether the dunes will become grassy or heathery depends chiefly on the presence or absence of grazing on them. The landward part of Tentsmoor (Fife) was at one time a heather moor of the wet type, but drainage has made it drier; it is now covered with luxuriant heather on a moderate depth of peat, and is preserved as a grouse moor. As a rule, the coast heath vegetation is dry, the heather being short and stunted, while the soil contains little organic matter.

Development of Heather Vegetation from Forest.—The development of heath on bare sand is probably the more primitive mode, yet Graebner considers that the majority of the existing heath areas in North-West Germany have been developed on the sites of former forests. This is admitted by most observers, and although the German plain is an area of low altitude, the results are worth considering in regard to the origin of British heather moorlands. R. Smith decided to adopt 2000 feet (608 metres) as the approximate upper limit of the heather moor; above this limit the heather either ceases or becomes a subordinate element in the blaeberry (*Vaccinium myrtillus*) type of vegetation. The birch wood or thicket also ceases about this altitude, and is the highest of our forest zones. Woods of larch and Scots pine occur in Northern Perthshire up to 1800 feet, but White's *Flora of Perthshire* gives isolated pines up to 1900 feet altitude. In Aberdeenshire, Dickie's *Flora* gives 2200 feet, and quotes from Watson's *Cybele* the finding of a pine trunk, 8 feet girth, in peat at 1650 feet. Geikie[1] says that pine trunks in peat are not uncommon from 1800 to 2500 feet altitude. The agreement between the upper limit of the principal heather area and the higher forest zones in Scotland is suggestive of a possible origin of the heaths from forests; in many cases this was doubtless so, but more evidence is required before this course of development can be admitted as universal. In North Germany the conversion of forests of a high national value into heather wastes of little value is an important economic question. The problem has naturally attracted much attention, and Graebner had it before him as one of his chief objects. The explanation most widely accepted is that of Krause and Borgreve; the forests have been exploited by man for the timber, and the failure to re-establish them is the result of errors in cultivation, of which the chief is the destruction of seedling trees consequent on the grazing of forest land by cattle and sheep. Graebner differs from most of his contemporaries. He regards the above view as too narrow, and considers that the climate and impoverishment of the soil are the chief causes. His arguments are here summarised. The rainfall of the "Heide," as already stated, is higher than the adjacent Steppe area of Northern Germany, and the soils are generally sandy. Rainfall on a heavy clay, or other soil of close texture, results chiefly in erosion, because the rain-water flows over the surface; on a sandy soil

[1] Geikie, J., *Trans. Roy. Soc. Edin.*, xxiv., pp. 363-384, 1865-66.

of loose texture there is more percolation. Rain-water sinking through the soil carries with it dissolved substances, which are either absorbed by the roots of plants or pass below into the subsoil. This action will in time reduce a sandy soil, moderately rich in soluble matter, to a condition when little soluble matter remains. According to Graebner, this condition is indicated by the spontaneous appearance of a heath vegetation. If the area be under forest, the trees assist in the removal of mineral food, but this will be returned to the soil if the trees fall and rot *in situ*. The exploiting of timber will reduce the material returned, and it is generally assumed that one-third of the mineral matter taken up by the tree is thus removed. Tables are given to show that there is a loss by removal of timber, and analyses by Ramann are quoted to show that fallen leaves do not replenish the soil for tree growth so much as is frequently stated. Graebner ascribes the disappearance of forest to impoverishment of a naturally open soil by rain, assisted by removal of timber, so that the materials necessary for vigorous growth are no longer available. Thus beech forest, with its subordinate vegetation of plants requiring a rich soil, gives place to a heath vegetation of dwarf growth and meagre needs. In the transition it is not uncommon to find a phase with Scots pine or spruce forest, since either of these is less demanding than beech. Graebner (p. 70) admits that the process of impoverishment in the way just described must be slow, and is limited to open soils poor in plant food to begin with. The development of heath from forest may be accelerated by other changes which produce a condition of poverty in the part of the soil available for plant growth; the most important changes of this kind are accumulation of humus and the formation of moor-pan.

Humus consists of the debris of plants which being returned to the soil become incorporated with it. The soil of a heavily manured garden or farm is rich in humus which is rapidly disintegrated and decomposed, largely through the agency of bacteria. In forests and under close masses of vegetation (*e.g.* heather) the plant remains decompose slowly and tend to accumulate as raw humus. Under such conditions light and air are deficient, and physical disintegration proceeds slowly, while bacterial action is largely replaced by the slower action of true fungi. The leaf mould of gardeners is raw humus collected in woods, while peat of various kinds is the raw humus accumulated under heather, cotton-grass, bog-moss, or other moorland plants. Raw humus may be formed on soils naturally rich or poor, and in all cases it masks the true action of the soil. The effects of raw humus on vegetation have been described by Grebe.[1] A layer of moderate thickness cuts off the underlying soil from oxidation and other atmospheric action, so that roots of plants are imperfectly aerated. Under heath vegetation the raw humus combined with the roots of plants forms a felted mass which interferes with the circulation of air and water in the soil; it hinders evaporation of superfluous water in spring, while in summer it forms a dry felt which prevents dew and light rains from reaching the soil. The raw humus, in

[1] *Zeitschrift für Forst- und Jagdwesen*, xxviii. (1896), pp. 513-542.

short, renders the soil unfavourable to plants which require fresh soil, active aeration, and sustained moisture. The formation of humus is accompanied by the development of organic acids, which in the case of raw humus are imperfectly oxidised, and their accumulation gives rise to changes prejudicial to the growth of most plants. The heath vegetation is adapted to growth in moor-humus by its modified xerophytic character and by the shallow growth of underground parts. The adaptations of heath-plants are dealt with in a paper by L. C. Miall (*Nature*, lviii., 1898, pp. 377 and 401), and in this or the special works of Warming or Kerner the details will be found. Two forms of heather vegetation are recorded on the Scottish maps, of which the one with shallow peat is the drier, the other is the bog or moss with deep peat.

The formation of moor-pan may precede or follow on the accumulation of raw humus. Its effect is to assist in masking the true fertility of the soil. Graebner's account of moor-pan is the best we have seen, and throws considerable light on the formation of heaths and peat. Moor-pan, as we translate the German word "Ortstein," may frequently be seen in drain-trenches or other exposures on our moors. It is a layer of humus-sandstone which may be recognised at the base of the peat if one probes with a long knife-blade downwards from the peat into the soil beneath; if pan is present, a distinct hard layer is met which turns the knife like a soft sandstone, and when exposed it can be removed as cakes of a dark brown stony material. A form of pan is familiar to farmers on certain classes of soil as a hard layer just beneath the ploughed soil; its effects are to stunt the root-growth of crops, hence it has to be periodically broken up by deep ploughing. Graebner's account of the development of moor-pan is as follows: The removal of soluble salts and the accumulation of raw humus lead to the exhaustion of the upper soil, which loses its powdery, crumbly texture and becomes caked together. The percolation of rain-water carries humus compounds and dissolved salts in solution downwards through the poorer layers of the soil to layers below as yet unexhausted, and here ensues a precipitation of both humus and mineral matter. The process may be seen when a deep trench is freshly dug in a heath area; water flows in from the peaty soil, and on reaching the bottom of the trench it meets the subsoil richer in mineral matter; there then occurs a precipitation of a gelatinous brownish layer which when dry is insoluble in water. Graebner also succeeded in making an incipient pan in a glass tube filled with heath sand. The occurrence of moor-pan in heaths has been proved by borings, and Graebner gives several of these. One locality may be given as an example: (*a*) heath-peat, 15 cm. (*i.e.* 6 inches); (*b*) bleisand, 20 cm.; (*c*) moor-pan, 4-10 cm; (*d*) marl-sand, 40 cm.; (*e*) diluvial sand. This arrangement of the layers is almost constant, though the thickness varies; the moor-pan is always deep enough to be protected from the action of frost, which breaks it when shallow. Chemical analysis of borings shows that below the moor-pan there is always a marked increase in the amount of soluble mineral matter. A well-developed moor-pan may resist the penetration of the roots of young trees or other plants, hence it cuts off the best part of the soil, and limits the plants to the upper impoverished

layers. In replanting the heaths of North Germany with forest trees, it is now considered necessary to break up the moor-pan by deep subsoil ploughing, previous to planting.

Minor causes of disforestation occur locally. Thus the influence of man in digging drains, building reservoirs, and otherwise disturbing the existing conditions of drainage, may favour one vegetation at the expense of another. Wind-borne sand may also overwhelm forests or other vegetation and lead to the development of heath or other sand types.

One of the objects of the Scottish botanical survey is to ascertain the extent of our primeval forest, hence the importance of Graebner's observations. The origin of the heather moorlands in Scotland has a very direct bearing on the afforestation of our moors, a prominent item in the work of the Scottish Arboricultural and kindred societies. In many instances it has been proved that, with proper treatment, our moors may be converted into forests of Coniferæ. This would indicate that the soil of our moors, especially the drier types of heather moor, is not yet too exhausted to carry forests. The extensive and successful conversion of heather moor into farmland in earlier times also points this way. At present we consider that a large proportion of the heather moorland in Scotland has been derived from ancient forest, but in the Pennine chain in England there is less evidence of this. The heath vegetation is the result of a moist climate, which favours the accumulation of raw humus cut off from the true soil by a moor-pan or an impervious layer of fine clay. Natural poverty of soil in itself is only responsible in a few cases, such as the thin stunted heaths of sand-dunes. Other causes of conversion are the influence of man through sheep-grazing and drainage, and, in a less degree, through the favouring of heather and its associates by the regular burning of grouse-moors.

Development of Peat masses.—Graebner traces the development of "Heide-moor," the peat bog vegetation of cotton grass (*Eriophorum*), crowberry (*Empetrum*), heather, blaeberry, etc., which is indicated on the Scottish vegetation maps by a special colour. The wet boggy moors of this kind may be developed in water, on bare soil, or from forest. His conclusions will prove useful to workers in such localities, but we defer discussion of them at present. Extensive areas of this type of vegetation have been examined in the Pennine chain of the north of England, and R. Smith has left field maps which show that the western part of Scotland is largely of this nature.

The development of heather and its associates on limestone is not a question which affects the heaths of North Germany. Graebner, however, has contributed some useful work on this. He has confirmed, along with other workers, that bog moss (*Sphagnum*), heather, and other typical heath-plants may grow in soils containing a large amount of lime-salts. The well-known absence of heath-plants on limestone soils is thus not due to any prejudicial effect of the limestone, but to the absence of the particular soil-conditions necessary to heather and its associates. In the course of our wanderings in North-West Yorkshire, we have frequently found heather closely associated with the carboniferous mountain limestone. In one case, near Settle, a summit-plateau of considerable area

carries heather vegetation resting directly on the limestone. The conditions which here favour the heath-plants are of two kinds: on the one hand, shallow deposits of peat have formed, a thing not common over limestone; on the other hand, the topography of the area renders it unsuitable for sheep-grazing.

Part II. of Graebner's monograph is an analysis of the biological types of vegetation included in his "Heide formation." The associations are distinguished by their habitat, and full lists of the species in order of their dominance are given. This portion of the work is of the utmost value to botanical workers on the heather vegetation, and as it becomes more widely known amongst botanists, it will assist towards a clearer recognition of what types of vegetation are. It is satisfactory to see a close agreement between Graebner's scheme and the plan adopted in the Scottish survey; comparisons are thus easy.

In conclusion, the monograph of Dr. Graebner is one of the standard books of reference on heather vegetation, and will repay careful reading.

THE RETURN OF PEARY AND SVERDRUP.

As already briefly noticed in our last issue, the *Windward*, with Commander Peary on board, arrived at Sydney, Cape Breton Island, on September 18, and the *Fram*, with Captain Sverdrup, at Stavanger, Norway, on September 19. It is now possible to give some account of the work done by these two gallant explorers and their respective parties. Data are not yet available from which maps may be constructed, but reference should be made to the map illustrating Professor Nansen's article in vol. xiii. p. 246 of this magazine. In regard to this map it may be well to point out that while on the American side it still practically represents the present state of our knowledge till the new results be fully available, on the opposite side of the Polar area Captain Cagni of the Duke of the Abruzzi's expedition made two years ago a notable advance, reaching 86° 33′ N. lat., the highest point yet attained by any explorer.

Commander Peary set out on his great journey in the summer of 1898, but his movements have been already chronicled up to the time when the *Erik* left him at a temporary camp in the vicinity of his quarters at Payer Harbour, near Cape Sabine in Smith's Sound, at about 78° 45′ N. This was on the 29th of August 1901. The winter was spent at Payer Harbour, which the expedition reached on September 16. A week later the Eskimo with the expedition began to sicken, and not one escaped illness. Six adults and a child died in camp, and early in the following January news was brought of a fatal epidemic among the Eskimos of Anvalik.

The first start was made on March 3rd, when Henson with six sledges set out for Fort Conger in charge of an advance party. Three days later the main party started with eighteen sledges, leaving Percy in charge at Payer Harbour. Fort Conger lies about 81° 30′ N., and the

distance between it and Payer Harbour is about two hundred miles. This distance was covered in eighteen marches. The Eskimos supporting the party went back on reaching Fort Conger, and after apparently but little delay the expedition set forth once more, the aim now being Cape Hecla, distant about one hundred miles. Cape Hecla lies to the north-west of the northern end of Robeson Channel, in about 83 N. lat. This journey was accomplished in eight marches, and on arrival it was found that Robeson Channel was all open water across to Greenland, while open stretches were visible as far as could be seen from Black Cape to Cape Ransome. On April 1 Peary set forth from Cape Hecla with Henson, four Eskimos, and six sledges, on his advance northwards, with the object if possible of reaching the Pole. It may be recalled that Admiral Markham's furthest north—reached on May 12, 1876—was 83° 20′ 26″ in longitude 64° W. Markham started from Cape Joseph Henry in 82° 55′ N., and took a month to reach his furthest point, some thirty miles to the north-west of his starting-point. Peary reached latitude 84° 17′, and then found further advance impossible. On the whole the kind of travelling experienced was much the same as that found by the English expedition, except for the lanes of young ice and the greater amount of open water. After six marches open leads and floes in motion were encountered, and two natives were sent back. As the expedition advanced the floes became smaller, the pressure ridges were on a grander scale, and open leads were more frequent. Finally, as already stated, the hope of advance had to be abandoned in lat. 84° 17′, and the return to Cape Hecla was begun. Owing to the formation of new leads, pressure ridges, and to fogs, the return was found in some respects more trying than the advance. Cape Hecla was regained on April 29, and Cape Sabine on May 15. The ice broke up earlier than in 1901, and Payer Harbour was blockaded almost continuously. The *Windward* bored her way through and entered the harbour on August 8, leaving with the expedition the same day. Although Commander Peary failed in his main purpose, it should be noticed that he holds the record on the American side, although on the other side Captain Cagni has approached nearer the Pole by 150 miles. The previous record on the American side was that of Lockwood of the Greely Expedition, who reached 83° 24′ N. in 1882.

Commander Peary's views on the Polar question generally may be given in his own words as reported in the press:—"Lieutenant Peary says he has a deep-rooted conviction that it is possible to reach the North Pole. In all his attempts during the last four years, he points out, he has not had a suitable starting-point, but he believes that the Pole can be reached on sledges by any adequately equipped expedition which makes latitude 83° its winter quarters. He has already made four sledge journeys, which covered a distance more than sufficient, had they been begun at that latitude, to carry him to the Pole. If he had means of his own to continue the work he would certainly not give it up, but he must now bow to circumstances. It is no more difficult to travel between latitudes 70 and 80 than between 60° and 70°, and he believes it is not any more difficult between 80° and 90 than between

70° and 80°. He would just as soon winter at Cape Hecla as at Sabine Island or Etah. It has been demonstrated to his satisfaction, he declares, that there is no open ocean in the voyage to the Far North. On the other hand, there is no foundation for the idea that there is an eternally frozen sea, though the waters are practically always covered with ice. He has demonstrated, he thinks, that Greenland's shore is the most northerly land of the earth's surface, and that all beyond it on the other side is ocean."

Captain Otto Sverdrup telegraphed from Stavanger to the Royal Geographical Society on September 19 in the following words:—"Arrived here to-day with the *Fram*. Our exploring work consists in the southern and the western shores of Ellesmere Land and other unknown fields to the westward. Braskerud died autumn 1899, otherwise all well." A further more detailed message was sent to the *Times*, and appeared in that journal, on Monday, September 22nd. The following is an abstract of this account. It may be remembered that the expedition left Christiania in June 1898, and consisted of sixteen men, of whom six were men of scientific training. In August 1898 the *Fram* was caught in the ice at Cape Sabine, off Ellesmere Land, about 79 N., on her way northwards. It is at this point that Captain Sverdrup's message begins. He states that they were finally stopped in the ice on August 17, and on account of the cold were compelled to take winter quarters at Rice Strait. During the winter a sledge journey was made on the inland ice of Ellesmere Land, and the work of exploring or mapping the innermost part of Hayes Sound commenced. In addition hunting was carried on for the sake of obtaining food for the dogs, and about twenty-three walruses and eleven musk oxen were obtained. In the spring of 1899 two sledge journeys were made across Ellesmere Land to the west coast, the one across the glacier district, the other further north across country free from ice. The mapping of Hayes Sound was completed, and scientific observations were carried on until the breaking up of the winter camp. The intention was to go northwards through Robeson's Channel in the summer of 1899, but the ice conditions during this season proved to be very unfavourable, and in August this plan was finally abandoned. On August 22 the *Fram* left Smith Sound and was seen by the members of the Peary expedition to be moving in the direction of Jones Sound. Winter quarters were set up on the south side of Ellesmere Land in lat. 76° 29′ N. and long. 84° 24′ W. From this spot Captain Sverdrup made a boating excursion with three men to explore and lay down a depôt. They were however caught in the ice and detained for a month on the return journey. It was during their absence that Braskerud died after some days' illness. Other journeys for the purpose of mapping and the laying down of depôts were also made during this autumn. On October 22 the party was stopped by open water at a distance of 68 miles from the vessel, but owing to the heavy fog no opinion could be formed as to its extent. The portion of the coast passed here ran in a true westerly direction instead of curving to the north as indicated in Inglefield's map. East of the depôt laid down here a large fjord was found. On November 16 the journeys for the autumn were finished.

At the end of February the depôt—which had been named Björneberg—was visited by a party, and owing to their report the leader himself set out to explore at the beginning of March. He found open water with large floes of ice floating backwards and forwards in the rapid current in the sound between North Kent and Ellesmere Land. The advance along the sound proved very difficult, and the party returned on March 14, only to start again with a larger equipment about a week later. This expedition was divided into two parties, consisting of nine men and dogs. The passage along the sound proved again very difficult on account of the pressure ridges, but after three days' travelling it was passed. It proved to be twenty miles broad, and has to the north, between Ellesmere Land and North Kent, a large bay, about 100 miles broad, extending to the eastward. To the north of this there are some large complicated fjords. The land extends about fifty miles westward from these fjords, after which it runs in a north or north-westerly direction. In lat. 79° the two parties, now reduced to two members each by the return of five of the original members to Björneberg, separated from one another, the one going northwards along the coast, the other proceeding to explore some new land to the west. The first party, which included Sverdrup, encountered very hilly land, intersected by many large fjords. They reached lat. 81° N., and found that the land extends in a northerly direction from this point. They experienced throughout very severe weather, and found game to be entirely absent. The other party reached the new land in long. 98° W., and then turned back and travelled southwards and eastwards to about long. 89° W. Here they discovered a large system of fjords, and proceeded up some of them. They were finally compelled to turn about 79° N. lat. At the spot where they turned the land was very low, and converged northwards on both sides, a fact which, together with the condition of the pressure ridge at this point, led them to believe that it was the end of the fjord—a point which they were, however, unable to fully investigate.

A third party, busied chiefly with geological work, also visited this fjord, and on their return crossed a large peninsula to the south-east of it. All these parties returned to the vessel in June, and on August 9 the *Fram* left her winter quarters, and, proceeding westwards along Jones Sound, finally got fast in the ice to the north of Grinnell Island. Here she remained for a month, and was finally freed on September 16, when she proceeded through Cardigan Strait to the fjord next the sound, where the expedition took up winter quarters in lat. 76° 48′ N. and long. 89° W. The winter was very stormy and cold, and during it the vessel was much visited by wolves. In March 1901 the laying down of depôts to facilitate exploration was commenced, but the weather was boisterous and cold. During the fourteen days occupied by the work the mean temperature was −45° C., and on some occasions it was below −50° C. Much of the season was spent in the exploration of land to the north and west of North Cornwall. As contrasted with Ellesmere Land, from which it is separated by a sound, this new land is low, not reaching over 1000 feet. It would appear to contain a considerable

amount of game; reindeer seemed to be plentiful, and bears were also shot. Other exploring parties devoted themselves to the land of North Devon to the south, and to the country in the vicinity of Greely Fjord.

The work for the season ceased in November. Previous to this the expedition had resolved to winter once more in the Arctic, but owing to the bad season the *Fram* was never out of the ice, and so was unable to proceed any distance further. By strenuous efforts they succeeded in forcing the boat some nine miles to the south, but she did not become free. In the spring Captain Sverdrup with one companion started northwards with the object of reaching Lieutenant Aldrich's point on Grinnell Land (1875). They turned back at lat. 81° 37′, whereas Aldrich reached 82° 48′. During this season other exploring parties were sent out to parts of Ellesmere Land and North Devon, and in August the *Fram* left Jones Sound for Godhavn.

From this account it will be seen that though none of the members of the *Fram* expedition attained any considerable northing, they appear to have done a large amount of mapping and exploring in the district—at present a blank in our maps—to the west of Ellesmere Land. Captain Sverdrup's original plan, which was to survey the north-east coast of Greenland, and at the same time to advance as far north as possible, was, as indicated above, entirely abandoned.

GEOGRAPHICAL NOTES.

EUROPE.

The Ben Nevis Observatory.—It must be a source of much satisfaction to all to learn that the work of this Observatory is to be continued for at least another year without change in its character. The Meteorological Council in London has agreed to continue its grant of £250 to the low-level observatory at Fort William and the grant of £100 to the high-level observatory. The proceeds derived from furnishing newspapers with meteorological reports and from other sources will amount, it is hoped, to about £150, the sum hitherto yielded. The balance of the cost of maintenance, amounting to about £1000, has been readily subscribed by the public. This satisfactory arrangement will enable the staff to prosecute their work without interruption till the Parliamentary Committee inquiry has reported. So great has been the public outcry against the threatened stoppage that it is expected that when the report of this Committee is available it will be found to be of such a nature that the Treasury will be constrained to enable the governing body to place the institution on a satisfactory financial footing of a permanent kind.

The Rivers of South Wales.—All the rivers of South Wales flow at right angles from the Main Divide, except those between and including the Towy and the Neath, which are deflected along level subsidiary disturbances from NE. to SW., *i.e.* parallel to the main water parting and axis of elevatory movement. Mr. Strahan considers that the rivers were initiated by what he unfortunately calls a Caledonian movement, but which it would be simpler and less confusing to term a WSW.-ENE. line of disturbance. He considers it is more recent than the Armorican foldings and those others striking NNW. which Lapworth has named

Charnian. This WSW.-ENE. axis of uplift determined the Main Divide, and the Severn, Wye, Towy, Taff, and Cleddan flow normally from it. The Towy, beginning as a normal consequent river, is deflected to the SW. by a disturbance parallel to this axis and parallel to others which determine the SW. trends of the Tawe and the Neath. The Taff crosses the Neath disturbance where there is no uplift on the south side, such as occurs farther to the SW., and is not deflected by it. Mr. Strahan suggests that a parallel WSW.-ENE. anticline along the present Severn-Thames Divide determined the water-parting between the basins of these two rivers. This can hardly be, and it is neither a necessary hypothesis, nor one which excludes that which it seems meant to replace, viz., that rivers have flowed from Wales to the south-east over what is now the Thames basin.—*Quarterly Journal Geological Society*, lviii.

Vacation Course at Oxford.—In connection with the School of Geography, a special course of lectures and practical work, both in and out of doors, was held between July 29 and August 21. It was specially designed for teachers, and the gratifying number of thirty, half of whom were women, took advantage of it. Of the students, two were university and college lecturers, five were lecturers in training colleges, and the others were masters and mistresses in public high and preparatory schools. With two exceptions, the men were university graduates. One student hailed from America, two from Wales, five from Scotland, and the others from the south of England. Mr. Mackinder delivered the opening lecture on the Scope and Methods of Geography. Mr. Dickson discussed recent advances in Geophysics and Climatology, especially modern theories of the figure of the Earth, atmospheric circulation, ocean currents and tides, and conducted the field class, which learned how to map with plane-table, prismatic compass, and clinometer. Mr. Darbishire held a class for map-drawing. Mr. Herbertson lectured on Typical Land Forms and their Distribution, and, with the assistance of Miss Croom-Brown, gave demonstrations of relevant large-scale maps, and lessons on the reading and interpretation of them. Mr. Beazley lectured on the History of Exploration, especially in more modern times. Economic geography was discussed by Mr. Beazley, whose subject was Land Trade-Routes, Present and Past; and by Mr. Herbertson, who discussed, by request, the Economic Zones and their Influence on Maritime Trade. The library of the school was much used, and Miss Croom-Brown acted as librarian. The course ended with two whole-day excursions, in both of which Mr. Mackinder took part. One was to the Windings of the Evenlode, conducted by Mr. Herbertson, and the other to the Upper Coln and the Thames-Severn Divide, conducted by Mr. Dickson.

ASIA.

Tsetse-fly Disease in the Philippines.—A disease affecting horses and other animals has been found to be very prevalent in the Philippines, where it is known as *surra*, and has destroyed 2000 of the American transport and cavalry horses in six months. The disease is also known in India and Burma, and is now regarded as identical with tsetse-fly disease. It is due to a Protozoon parasite—*Trypanosoma evansi*—and the intermediary is found to be a fly known as *Stomoxys calcitrans*. This fly lays its eggs in the dung of horses and cattle, and the only method of keeping down the disease appears to be the destruction of the larvæ and pupæ of the fly in the dung by means of lime or petroleum.—*Amer. Med.*

Exploration in the Himalaya.—Mrs. Fanny Bullock Workman, F.R.S.G.S., and Dr. William Hunter Workman, F.R.G.S., have completed the first ascent and exploration of the Chogo Loongma glacier, extending north-west from Arondu

Basha valley thirty miles to its culmination at a height of 19,000 feet. The glacier ascends in this distance from the village of Arondu 9200 feet. The expedition also ascended three of its upper tributaries, making a total of fifty-five miles of new glacier explored. During the month of August no camps lower than 15,000 feet were made, while most halts were at 16,000, 17,500, 18,000, and the highest bivouac, at the top of Chogo Loongma, was at 19,000 feet. Four first ascents of peaks and two new snow passes, varying in height from 16,000 to 19,200 feet, were made. The ascent of a sharp ice wall at the head of a Chogo Loongma branch was of great Alpine difficulty, and, from a glacial base camp, required six hours of step-cutting to its summit, 19,200 feet. The descent, which had to be negotiated stepping backwards, was so long and arduous, that the head guide said at the outset that camp could not be reached by night. However, by constant moving, and not stopping for more than five minutes at a time during the day for refreshment, the party reached their Mummery tents at nightfall.

The Chogo Loongma scenery is of unprecedented grandeur, as is that of the twelve-mile-long glacier, running north-west of the great Haramosh chain. The party made a first ascent of the snowy col, 17,500 feet behind Mt. Haramosh to the north, and gave it the name Amar Singh La.

First photographs of Mt. Haramosh, 24,285 feet, were taken from this side, and of many fine peaks rising to nearly an equal height. The great wall rising above the top of the Chogo Loongma glacier was christened the Pertab Singh La, in honour of His Highness the Maharaja of Kashmir. The summer was not a propitious one in Baltistan, the weather seldom remaining fair for more than two days at a time. At one high camp on the glacier the members of the party were kept in their tents by a snowstorm of sixty hours' duration, and were deserted by all their coolies. The British and native governments rendered great assistance, keeping village chiefs and government chaprassies at Arondu for six weeks to furnish fresh relays of coolies and send up sheep and supplies to the last grass camp.

Col. H. H. Godwin-Austen surveyed the lower part of the Chogo Loongma many years ago to a height of about 11,500 feet, but Dr. and Mrs. Workman are the first to explore it beyond that point, and Mrs. Bullock Workman has added to her record climb of Koser Gunge, 21,000 feet in 1899, another record of being the only woman to make the first ascent of one of the great Himalayan glaciers.

Dr. K. Oestreich of Frankfurt a M, topographer, and guides Mattia Zurbriggen and Giuseppe Müller, accompanied the party.

We hope at a later date to publish a full account of Dr. and Mrs. Workman's recent explorations, illustrated by photographs.

AFRICA.

The German Kamerun Colony.—This colony appears to be prospering. The white population includes 548 persons, of whom 456 are Germans. In 1900 the total exports were 5,586,000 francs, a gain of more than one million francs as compared with the preceding year, notwithstanding the fact that the amount of ivory and rubber has diminished. Eighty-seven ships have entered the ports as contrasted with sixty, more than half being German. The Europeans chiefly cultivate cacao, and the director of the Botanic Garden at Victoria has visited Central and South America in order to ascertain the best kinds of cacao-trees for the purpose. The largest plantations are that of the West African Company at Victoria, which contain 1000 hectares planted with 450,000 trees, and that of the Bibundi Company. Among the public works executed in 1900-1, special mention should be

made of the construction of several roads. A new post—Ossidingue—has been founded by Captain Glauning on a plateau dominating the river Cross; to this has been moved the station previously erected at Nssakpe. The garrison at Ossidingue has laboured at road-making, the roads going from Abokum to Manpe and to Nassanakang having a width of 4 metres; the last-named follows the course of the Cross. Lieutenant Unruh has begun a road which, setting out from Ossidingue, crosses Keakaland to reach Tinto. During November and December an expedition was undertaken against the Bangwa, and Bafut and Bandeng were taken. The country round about these places is very difficult. The mountains rise abruptly to an altitude of 2400 metres, and are hollowed out by deep gorges in which run numerous torrents. At Bamenda a station has been established at a height of 1300 metres, on a plateau furnished with water and with wood for constructing defences. The post is one day's journey from Bali, Bafut, Bakom, and Bangangu. The King of Bali, terrified by the defeat of the Bafut and the Bandeng, has signified his submission.—*Revue de Géographie.*

AMERICA.

West Indian Eruptions.—The Royal Society of London has now published a preliminary report by Dr. Tempest Anderson and Dr. J. S. Flett on this subject. They report that the Soufrière of St. Vincent is a mountain which in general form recalls Vesuvius. It is a simple cone, having at its northern side the remains of a gigantic crater ring—the "Old Crater"—which has on its north-east tip a smaller crater, known as the "New Crater," because it apparently originated in the eruption of 1812. It was from the Old Crater that most of the materials of the present eruption were emitted. They chiefly accumulated in certain deep valleys which have been cut in the slopes of the mountain, especially on its southern side. The eruption of May was far from unexpected, for violent earthquake shocks had been experienced in the north of the island for more than a year, but it was on Tuesday, May 6, that the first actual outburst occurred. On the leeward side the crater was quite visible, and the inhabitants, alarmed by the frequent outbursts of steam, fled southward, and so for the most part escaped. On the windward side the summit of the mountain was wrapped in a cloud, and the inhabitants of the rich Carib country continued their ordinary pursuits, in spite of some telephonic warnings, during the whole of Tuesday and on Wednesday morning. When at midday on Wednesday they first became thoroughly alarmed, it was too late to escape, for many of the streams—usually dry, except after rain—were running boiling hot, and could not be crossed. It was here that the greatest destruction of life took place, about 2000 probably being killed.

As to the course of the eruption, the phenomena on Tuesday consisted chiefly in outbursts of steam, which greatly increased in violence towards evening and during the night. By next morning the volume of the clouds had greatly increased, there was much lightning, and showers of stones and mud took place. About midday the rivers Wallibu and Rabaca were observed rushing down as raging floods of boiling water, and later the filling of the valleys with this water caused the whole mountain to be enveloped in a cloud of vapour. This was probably due to the bursting of the crater lake and the sweeping of its waters downward to the sea. About two o'clock a terrible outburst took place, and a large black cloud swept with terrific velocity down the mountain, burning and suffocating all living things which it encountered. The cloud was intensely hot, smelt strongly of sulphur, and was suffocating in nature. It lasted only a few minutes, and was followed by complete darkness and a continuous rain of ash and

stones. The darkness gradually lifted, and on May 15th the volcanic activity had apparently subsided. On May 18th a fresh eruption took place, but did practically no damage. In their ascent of the Soufrière, Drs. Flett and Anderson were able to follow the course of the great sand-blast, and to make out its gradual diminution in velocity, and in the contained heat as it approached the sea, by studying the effects produced at different levels. Apart from the deposits of ash and the changes in the crater, the only geological change which they noticed was the disappearance of a narrow strip of coast along the leeward side of the island.

Drs. Flett and Anderson also visited Martinique, and were fortunate enough to observe on July 9 an important eruption from Mount Pelée while in a sloop in the bay. They believe that in all essentials the original eruptions of the Soufrière and of Mount Pelée were identical in character, and give the following summary of their observations and conclusions. "The most peculiar feature of these eruptions is the avalanche of incandescent sand, and the great black cloud which accompanies it. The preliminary stage of the eruption, which may occupy a few days or only a few hours, consists of outbursts of steam, fine dust, and stones, and the discharge of the crater lakes as torrents of water or of mud. In them there is nothing unusual, but as soon as the throat of the crater is thoroughly cleared, and the climax of the eruption is reached, a mass of incandescent lava rises and wells over the lip of the crater in the form of an avalanche of red-hot dust. It is a lava blown to pieces by the expansion of the gases it contains. It rushes down the slopes of the hill, carrying with it a terrific blast, which mows down everything in its path. The mixture of dust and gas behaves in many ways like a fluid. The exact chemical composition of these gases remains unsettled. They apparently consist principally of steam and sulphurous acid. There are many reasons which make it unlikely that they contain much oxygen, and they do not support respiration."—*Proceedings Royal Society, London.*

AUSTRALASIA.

Games of Australian Native Children.—Mr. W. E. Roth, in *Bulletin* No. 4 of *North Queensland Ethnography*, gives an interesting account of the games, sports, and amusements practised by the native children of Australia. He classifies the games in seven groups—(1) Imaginative games, such as story-telling, nine examples of stories being given; (2) Realistic games, such as playing with pet animals, with plants, making smoke spirals, bathing, and so on; (3) Imitative games, in which objects and phenomena of nature are imitated by attitudes, movements, and paintings. Under the last category Mr. Roth figures no less than seventy-four examples of "cats-cradles," in which the Australians excel, as do most primitive peoples. Under this category are also included all the games in which the children mimic the activities of their parents, as in "collecting honey," "catching cockatoos," and so on. Then we have (4) Discriminative games, such as hide-and-seek, and a guessing game; (5) Disputative games, such as wrestling, and a tug-of-war; (6) Propulsive games, such as those with balls and tops, stick-throwing, and so on; finally (7) Exultative games, including songs, dances, and music. Such investigations as this are likely to prove of great scientific value, especially when, as in the present case, they are fully illustrated.

Botanical Surveys in Australia.—In connection with the papers by various authors which have recently appeared in our pages on botanical surveys and related subjects, it is of interest to notice Mr. J. H. Maiden's presidential address to the Linnæan Society of New South Wales. The author discusses the necessity

for a complete botanical survey of that country to be carried on by a number of independent workers, and for this purpose suggests that the region be divided out into a number of definite areas, a tentative scheme being set forth in the chart which accompanies the paper. The object of the botanical survey would be to summarise and extend existing records.

POLAR.

Scottish National Antarctic Expedition.—The trial trip of the *Scotia*, the vessel of the Scottish National Antarctic Expedition, took place on Saturday, October 18. The weather was perfect, and the bright sunshine and light winds, with a salubrious and almost summer temperature, enabled those on shore and on passing vessels to get an excellent view of the ship. Few recognised in the graceful craft a vessel of immense strength, capable of resisting ice pressure; but the *Scotia* was easily noticed, not only as an auxiliary barque not familiar in the Clyde, but also by her main topmast carrying a crow's nest, which marked her out as a vessel intended for ice navigation. The primary object of the day's cruise was to put the ship through her speed and coal consumption trials. At noon she was running for the measured mile. The result was most satisfactory, for she succeeded in averaging more than eight knots, a speed not only in excess of what was aimed at, but greater even than that of any of the three vessels at present engaged exploring Antarctic seas. The experiments in the consumption of coal were most satisfactory. The *Scotia* also went through a series of manœuvres, which proved satisfactory, and it was gratifying to observe that she quickly answered the helm, a point which is especially valuable in ice navigation. Luncheon and tea were served on board, and toasts, coupled with the names of Mr. G. L. Watson, Mr. M'Credie, of the Ailsa Shipbuilding Company; Mr. Robin, of Messrs. Muir and Houston (Limited); and Mr. James Reid, of Paisley, who have carried out the reconstruction of the ship, were submitted. Mr. Watson referred in glowing terms to the excellent work put into her by the Ailsa Shipbuilding Company, and also by Messrs. Muir and Houston (Limited), who have constructed the new engines; and by Messrs. Reid, of Paisley, who are responsible for the exceptionally fine winches specially adapted for the trawling and sounding work in great depths which the expedition is to undertake. Messrs. Barr and Stroud had on board their range-finder, which is to be used during the voyage. This is the first occasion on which a range-finder has been employed in the work of Polar expeditions. Sir John Murray, K.C.B., President of the Society, invited the Council of the Royal Scottish Geographical Society, representatives of the Royal Society of Edinburgh, subscribers, and others who assisted in the scientific outfit, to meet Mr. Bruce and the members of the expedition at a dinner in the North British Station Hotel, on the evening of Thursday, October 23.

The Baldwin-Ziegler Expedition.—Somewhat to the surprise of those interested in this expedition, the ship *America* arrived at Honningsvaag on August 1, with the whole of the party on board. The proposed dash to the Pole this year has not taken place, owing, as Mr. Baldwin states, to the fact that the establishment of depôts by steamer last year was impossible, as the channels through Franz Joseph Land remained blocked by ice during the autumn of 1901. The breaking up of the ice early in June compelled the party to use up their reserve supply of coal, and this necessitated a departure from Camp Ziegler on July 1. Mr. Baldwin has however been able to establish depôts of food which will render possible a dash for the Pole next year. An enormous depôt of condensed foods

has been made on Rudolf Land within sight of the Italian expedition's headquarters, a second in lat. 81° 33′, and a third at Kane Lodge, Greely Island, which has been newly charted as near the 81st degree of latitude. Among the materials brought back are the first moving pictures of Arctic life, paintings of Nansen's hut which was discovered by the party, marine collections, new charts, and so on. But, as is pointed out by the Newfoundland correspondent of the *Times*, the relative paucity of the results is the more remarkable in view of the very complete nature of the equipment, which included every scientific contrivance likely to prove of value to the expedition. It is now suggested that it was this very elaboration of equipment which hampered the movements of the party, by diminishing its mobility. Baldwin's return is the more remarkable in view of the fact that, as announced in our August number, the *Frithjof* was on her way northwards with additional supplies. She found a deserted camp in Alger Island in place of the expected party of explorers.

GENERAL.

Recent Volcanic Eruptions.—A Reuter message states that the small island of Tori Shima, which is one of a chain extending between the Bonin Islands and the main island of Japan, was overwhelmed by a volcanic eruption between August 13 and August 15. All the houses on the island have been covered up by volcanic *débris*, and the whole of the 150 inhabitants have perished. On August 18 the eruption was still proceeding, together with a submarine eruption in the vicinity of the island. At Banyuvangi in Java it was noticed that the Rooang volcano was more than usually active about the time of the West Indian eruptions in May. As is pointed out in *Nature*, intimations of volcanic eruptions, earthquakes, and similar phenomena have been of almost daily occurrence since April, and the evidence that the present year is in several respects abnormal has been accumulating on all hands.

Cause of Beri-beri.—According to *Nature*, Major Rost, I.M.S., has discovered a bacillus which he regards as the cause of beri-beri, a disease of great importance in many parts of the East, where it especially affects coolies. The bacillus occurs in fermenting rice and in rice-liquor, and produces in fowls many of the symptoms found in beri-beri in man. Further, the same symptoms appear in fowls fed on fermenting rice. The disease is therefore ascribed in man to the use of fermenting rice as an article of diet, and especially to rice-liquor, a beverage in which the coolies largely indulge, while the women and children, who are only infrequently attacked by beri-beri, rarely or never drink the rice-liquor.

Hydrographical Observations on the "Princesse Alice."—Mr. J. Y. Buchanan gives in *Nature* some notes of the observations made during a cruise from Gibraltar to the Azores. On July 24 an interesting sounding was made in lat. 36° 6′ N., long. 10° 16′ W. (Paris). The depth was 1473 metres, and the temperature of the bottom water was 9·4° C., while the dredge coming from the same depth brought a quantity of mud which had a temperature of about 8·75° C. The temperature is thus unusually high for the open waters of the South Atlantic; at such a depth it should only be about 1·5° C. It is evident that the sounding struck one of the main drains out of the abysmal regions of the Mediterranean, and the water must be regarded as a mixture of the deep water of the Mediterranean with that of the neighbouring regions of the North Atlantic. Unfortunately no sample of the bottom water was secured, so that the above conclusion could not be confirmed by a study of the salinity, but it is obvious that much interesting research still remains to be done in this locality.

A series of soundings was also made off the Josephine bank, and they showed that the bank differs markedly from the Govringe bank in the great uniformity of depth.

Hugh Miller Centenary Celebration.—On August 22 a centenary celebration of the birth of the geologist Hugh Miller was held at Cromarty, at which Sir Archibald Geikie delivered an address, published in full in the columns of *Nature* for August 28. We can here only draw our readers' attention to this most eloquent account of one of Scotland's great men. It was listened to by a large audience which had assembled to do honour to Hugh Miller's memory, and which included scientific men from the United States, Canada, and Italy, as well as from various parts of the British Isles.

COMMERCIAL GEOGRAPHY.

The Stassfurt Salt-mines.—Among the mineral industries of Prussia the Stassfurt salt-mines now play an important part. Until nearly the middle of last century Prussia produced scarcely more than 100,000 tons per annum of common salt. This amount did not suffice for domestic purposes, and the demands of industry and agriculture had to be met by imported salt. The Prussian salt was then obtained by the evaporation of brine springs, which made the product increasingly expensive. After prolonged boring a bed of good rock-salt of 300 metres thick was found in 1851. This bed has an overlying layer containing a very hygroscopic mixture of salts of potassium, soda, and magnesia, which until 1860 was regarded as simply an inconvenience in the working of the salt. In that year a M. Franck, a chemist in a neighbouring sugar manufactory, pointed out the importance of these salts as manure and as the raw material for the manufacture of various valuable salts of potassium. Soon afterwards manufactories were established for the purpose of utilising the salts. The amount dealt with rose rapidly from 20,000 tons to 139,000 in 1864, while in 1900 no less than 3,037,000 tons of unpurified salts of potassium and 927,000 tons of chloride of sodium were exported from the Stassfurt district. The twenty works of the district are now all under one syndicate and employ 16,000 workmen; they are mostly occupied with the manufacture of fertilisers, for which the demand is greater than for chemical products in the strict sense.—*Revue Scientifique.*

Commerce of Alaska.—The Treasury Bureau of Statistics estimates the present value of the market of Alaska at a million dollars per month. The principal industries are gold, fish, and furs, and they send to the United States 15 million dollars worth of their products, gold accounting for 8 millions, fish for 6 millions, and fur for 1 million. The original cost of the country was 7,200,000 dollars, and the Government has derived since its purchase a revenue of 9 million dollars, while the value of the products are now twice every year as much as it cost. The total value of the products brought to the United States since its purchase amount to about 150 millions, of which 50 millions are precious metals, 50 millions products of the fisheries, especially salmon, and 50 millions fur, chiefly seal fur. Probably 50 millions of American capital are invested in Alaskan industries and business enterprises, the salmon fishery alone employing a capital of 22 million dollars.—*National Geographic Magazine.*

Problems of the Pacific.—Under this title the Hon. O. P. Austin discusses the part likely to be played in the future by America in the commerce of the Pacific. Hitherto American commerce with the East has not attained great proportions,

in part because enterprise has been chiefly concerned with home problems, and in part because of the difficulties involved. One difficulty has been that the great producing and consuming centres of the United States are on the eastern half of the continent, and the heavy railway rates across the continent have made competition with the European powers—so much nearer the market—almost impossible. So prohibitive are the trans-continental rates that most of the commerce is carried on by means of the Atlantic Ocean rather than by the more direct Pacific route. The Isthmian canal, when realised, will help to solve this difficulty, and the author is of opinion that the United States now possesses greater facilities for utilising this the Pacific than any other power, and that it is of great importance to the nation that the advantages be fully utilised. In the first place, the United States—according to the author—possesses a longer Pacific coast-line, and more numerous and better harbours than any other nation, the coast-line being greatly increased by the island possessions of the country in the midst of the Pacific. Again, the United States has six distinct railway lines connecting the Pacific seaboard with the Atlantic, while Canada has but a single line, and on the other shore Russia has similarly only one; thus America has better railroad facilities for transporting commerce to and from the water's edge than any other power. Thirdly, America now owns the chief islands of the Pacific which constitutes ports of call for the ocean steamers, a point of great importance in an ocean of the dimensions of the Pacific. The most important of these are Unalaska, Midway Island, the Hawaiian Islands, Tutuila in the Samoan group, Guam in the Ladrones, and the Philippines, all lying upon the natural routes for vessels in direct commerce between the United States and the East. Fourthly, the most important routes for submarine cables in the Pacific are commanded by American territory. "The Hawaiian Islands, Wake Island, Guam, and the Philippines form a continuous line of great natural telegraph poles upon which we may string a wire or series of wires, by which we may converse across this great body of water, stretching halfway round the globe, making every one of its intermediate landings and relay stations on our own territory and protected by the American flag." Fifthly, the city of Manila constitutes a most valuable distributing point for eastern commerce, placed as it is at a point where the steamship and sailing lines of the Western Pacific converge. There is some reason to believe that it will become to American commerce in the East what Hong-Kong and Singapore are to British. Finally, the author considers that the winds and ocean currents are all in favour of American commerce across the Pacific. His conclusion is expressed as follows:—"Indeed, when we consider all these things, we might almost claim the Pacific as essentially our own. Stretching along its eastern coast from the tropics to the Arctic, thence across its northern borders, then for more than a thousand miles on its western shore, in the Samoan group on the south, and in a line of islands across its very centre, the American flag floats, and will continue to float, and by its presence, its ennobling purposes, and its power for civilisation and advancement, it proclaims, and will continue to proclaim, that the Pacific is and will remain an American ocean."—*National Geographic Magazine.*

The Trans-Siberian Railway.—In *Le Mouvement Géographique* there appear some interesting figures in regard to the overland journey from Paris to Pekin. From Paris to Moscow the journey takes 2 days 9 hours, from Moscow into Manchuria 11 days 9 hours, from Manchuria to Kharbin 3 days 4 hours, from Khartin to Vladivostok 1 day 20 hours, and to Port Arthur 2 days 10 hours. In order to reach Pekin it is necessary to leave the Port Arthur line at Tachitao, whence it requires three days to reach Pekin. It thus takes about

twenty-two days to travel from Paris to Pekin by rail, and this time will soon be shortened to eighteen days. Even at present, however, the Trans-Siberian railway has halved the distance between Paris and Pekin, for it takes forty to forty-five days to travel by sea. The price also is greatly reduced. From Paris to St. Petersburg the ticket costs 366 francs, from St. Petersburg to Moscow 70 francs, Moscow to Pekin 540 francs. Reckoning the cost of food at 15 francs per day from Paris to St. Petersburg, and at 10 francs per day beyond, the total cost of the land voyage comes out at 1216 francs as against about 2200 francs by sea.

NEW BOOKS.

EUROPE.

Spanish Life in Town and Country. By L. Higgin. Pp. 289. London: George Newnes, 1902. *Price* 3*s.* 6*d.*

In any work on Spain at the present time one looks with interest for the writer's opinion as to the country's prospects in view of the crisis through which it has recently passed. Spain's outlook, in the author's opinion, seems brighter to-day than it has ever been since the golden age of Isabel and Fernando. Every one in this country will join in the hope that this prediction may prove true and in wishing "God speed" to the young monarch who has recently assumed the burden of empire. The book is ably written, and the chapter dealing with the various types which go to make up the population is specially informative. As the author points out, the fact that Spain is rapidly becoming homogeneous must be taken into consideration in estimating the present impulse towards national growth and industrial prosperity. It is interesting to note that the Carlists are compared to those "amiable people in England who call themselves legitimatists and pray for the restoration of the Stuarts." It is only in English magazines, it appears, that the coming triumph of Don Carlos is predicted, and no Spaniard takes the trouble to notice such journalistic fictions. The last two chapters deal with Portuguese life, and are written by Eugéne E. Street.

ASIA.

India and its Problems. By William Samuel Lilly. London: Sands and Company, 1902..

The author of this book was, as we gather from the preface, a member of the Indian Civil Service, and in this work he proposes to put before us a bird's-eye view of the Indian Empire, and to "discuss a few of the more important problems now confronting us there." The inadequacy of his treatment of the subject he has undertaken may be gathered from the fact that the languages of India are disposed of in four pages, the Hindu history of India in nine, and the English conquest down to the annexation of Burmah in seventeen. In like manner he treats with summary sketchiness problems such as the frontier question, local self-government, the condition of the ryots, etc., each one of which has already what might fairly be called a literature of its own. A careful perusal of the work leaves us with the impression that the writer is generally "agin the government," and that he anticipates a Russian invasion from the north-west at no very distant date; he vigorously denounces Free Trade and the neglect of Indian industries. Notwithstanding this, he quotes the testimony of one of the greatest of the Indian statesmen of the day, viz., Sir Madhava Rao, that "there is no community on the face of the earth which suffers less from political evils, and more from self-inflicted, or self-accepted, or self-created, and therefore avoidable evils, than the Hindu community" We

may not say that Mr. Lilly belongs to the school of Mr. Digby or Mr. Hyndman, but he is tending towards their absurdities. We hope that those who read this work will not rest contented with it, but will prosecute their study of Indian history, conditions, and problems in other works, where these important subjects are adequately treated.

AFRICA.

The Uganda Protectorate. By Sir Harry Johnston. London: Hutchinson and Company, 1902. 2 vols. *Price* 42*s.*

This great work defies criticism that shall be adequate. Following the same author's book on British Central Africa, published in 1897, these volumes form an illustrated encyclopædia of Eastern Equatorial Africa. Sir Harry Johnston, gold medallist of our Society, combines in himself almost every qualification which the production of such a *magnum opus*, requires. As personal explorer of these regions after experience in West Africa, he comes second only to Stanley. As a philanthropic administrator of vast territories only beginning to rise out of the savagery of the past, he has won for himself a high reputation. As a savant he has placed his name high in the annals of zoology and anthropology, as an artist he has reproduced in the most lavish fashion the lands and the peoples and the animals of those unknown countries for our accurate information and delectation. He has given the whole a permanent and attractive literary form, by the charm of his style and the modesty of his narrative. These two quarto volumes thus form the noblest contribution yet made, or likely to be made, to the now abundant literature of African travel and civilisation. Mr. J. G. Bartholomew has worthily co-operated with Sir Harry in the clear and beautiful maps of Uganda, which show its administrative divisions, its orographic features, the density of its native population and the European settlements, its religions, its rainfall and navigable waterways, the range of its vegetation, the distribution of its native races and the general spread of its language groups.

Whether he deals with the reputation of the travellers and writers who have preceded him, or with the work of the Christian missions from Great Britain and from Rome, Sir Harry Johnston is remarkably fair. In the one instance where he reflects on Burton and that traveller's treatment of Speke and Grant the truth is told (page 218) without partiality, but with judicial plainness. Speke's premature death and the indifference of Lord Palmerstone's government prevented these two distinguished travellers from receiving the honours which were their due. The whole religious question is discussed with a freedom from prejudice not always apparent in the author's former work. Justice is done to the Church Missionary Society, and especially to Alexander Mackay. The remarks and suggestions as to taxation, labour, and industrial training of the natives suggest a compromise that deserves attention from the Colonial Office and Lord Milner at the present time.

If the work has a fault, it is one due to the author's temperament, and characteristic of his other writings. He is an optimist. The value of this sanguine spirit to the explorer of a continent so dark as Africa cannot be overestimated. But the thoughtful and practical reader must frequently remind himself that, some eighteen years ago, Sir Harry Johnston predicted far greater things of the Congo basin than have been or ever can be realised, especially as to the occupation of parts of that territory as sanitoria for Europeans. The reader is carried away by the charming descriptions of the Nandi plateau, as illustrated by drawings and photographs. But the critic who is familiar with the hill sanitoria of the Himalaya and Nilgiri mountains of India will not be convinced that Nandi is likely to be any better fitted for the permanent occupation of British capitalists

and labourers, and their reproduction, than Darjeeling, Mussoorie, and Simla; Ootacamund, Coonoor, and Kodaikanal. The Nandi plateau is between seven and ten thousand feet in altitude, "without a single ugly or unfriendly spot," and almost entirely without native inhabitants. "It seems," writes the enthusiastic Sir Harry, "to be awaiting the advent of another race which should make it a wonderland of wealth and comfort, a little England, half a Scotland or a large Wales, lying exactly under the Equator at an average altitude of 4000 feet above the Victoria Nyanza, of whose silvery gulfs and ghostly mountain coast-line glimpses at a distance of ninety miles may be caught occasionally from some breezy height, or through the interstices of woods which might be themselves in Surrey." That is a typical sentence of our author's. But while there is no evidence that these Europeans will propagate any more than in India, and while we doubt if the rainfall has been long enough observed and recorded to justify confidence in the seasons, we find our author supported in his agricultural dreams by the last report to the Foreign Office by Mr. R. N. Lyne, Director of the Agricultural Department of Zanzibar. "In the Kikuyu country the soil is a deep ferruginous loam, embracing about 2,000,000 acres, well watered and little subject to drought. Eight or ten Europeans are already engaged in cultivation outside the Missionary settlements, and raise great crops of potatoes which find a ready market locally and even in Zanzibar. The land is also most suitable for growing wheat, barley, rye, cotton, and tobacco, and may develop into a rich pastoral country. It is a land of the small capitalist rather than of the large landholder, and is best adapted for occupiers of from 500 to 1000 acres with £1000 to £1500 working capital." "A climate that is excelled by probably no other in the world, wherein a white man can not only live in comfort but work in comfort, a rich virgin soil, a good supply of cheap labour"—these, says Mr. Lyne, are amongst the advantages the Kikuyu highlands have to offer to the intending immigrant. The summit of the escarpment in the Mau country is also splendidly adapted for sheep rearing; the elevation is such that Scottish shepherds could work all the year round and Indian and native labour be dispensed with, if necessary."

Meanwhile, and for decades to come, the temperate regions of South Africa and the Colonies are likely to absorb all the practical farmers with a small capital who might now turn Nandi into the bit of South England pictured by our author. The British tax-payer has spent ten and a half millions sterling on the Uganda and East African Protectorates, their railway, pacification, and administration. The gain to humanity in the comparative extinction of the slave-trade and the progress of Christian civilisation is worth all that. Much more than that used to be spent fruitlessly on the Navy, which failed to stop the slave-trade from East Africa to supply the harems of the Musalman world with eunuchs and concubines. Sir Harry makes the wise suggestion that that sum should be the first charge, as a national debt, on the revenues of both Protectorates, which should be as soon as possible welded into one.

We now await the commercial development of Eastern Equatorial Africa by British steamers. On this subject Sir Harry Johnston is strangely silent. Yet subsidised steamers, such as the late Sir William Mackinnon pleaded for, while the German line was encouraged to monopolise the trade of East Africa, must be the necessary complement of the Uganda Railway. On that we have spent about five millions, and will have to pay two millions more for its maintenance in each of the next ten years, according to even the optimistic Sir Harry. The late Commission on Shipping Subsidies had the claims of East Africa powerfully put before it. It is time that the Foreign Office did something to check the German monopoly which its supineness has created.

BOOKS RECEIVED.

We have received the following new books, which will be reviewed in due course :—

Der Hercynische Florenbezirk. Von Dr. Oscar Drude. Die Vegetation der Erde, VI. Leipzig : Wilhelm Engelmann, 1902. Pp. xix + 670. *Price* 30 *marks.*

Murray's Handbook for Travellers in Ireland. By John Cooke. Sixth edition. London : Edward Stanford, 1902. 8vo. Pp. vi + 557. *Price* 9*s.*

Through the Casentino. With hints for the Traveller. By Lina Echenstein. London : J. M. Dent and Co., 1902. 12mo. Pp. vii + 143. *Price* 2*s.* 6*d.*

Italian Life in Town and Country. By L. Villari. London : George Newnes and Co., 1902. Cr. 8vo. Pp. xii + 257. *Price* 3*s.* 6*d.*

Journey to Lhasa and Central Tibet. By Sarat Chandra Das. Edited by the Hon. W. W. Rockhill. Royal Geographical Society. London : John Murray, 1902. Large crown 8vo. Pp. x + 285. *Price* 10*s.* 6*d.*

Aus den Staaten der Barbaresken. Von Dr. S. Dagobert Schoenfeld. Berlin : Dietrich Reimer, 1902. Large 8vo. Pp. 277. *Price* 8 *marks.*

Among Swamps and Giants in Equatorial Africa. By Major H. H. Austin. London : C. Arthur Pearson, 1902. Demy 8vo. Pp. xii + 354. *Price* 15*s.*

Isle of Wight. Illustrated Guide Books. London : Ward, Lock and Co., *Price* 1*s.*

Also the following reports, etc. :—

Transactions of the Gaelic Society of Inverness. Vol. xxiii., 1898-99. Published 1902. Inverness.

Administration Report on the Railways in India. By A. Brereton. Simla : Government Central Printing Office, 1902.

Catalog der in Norwegen bis Juni 1878, *beobachteten Nordlichter.* Zusammengestellt von Sophus Tromholt. Kristiania : Jacob Dybwad, 1902.

Eastern Uganda : An Ethnological Survey. By C. W. Hobley. London : Anthropological Institute of Great Britain and Ireland, 1902.

Report of the Department of Lands and Survey, New Zealand, Year 1901-1902. By W. A. Marchant. Wellington : John Mackay, 1902.

The following have been presented to the Library of the Society :—

Essai de Chronologie des Variations Glaciaires. Par Charles Rabot. Extrait des *Archives des Sciences Physiques et Naturelles,* Août 1902. Presented by the author.

The Physiography of Edinburgh. By R. Richardson. Reprinted from *Scottish Geographical Magazine,* 1902. Bound in cloth. Presented by the author.

The Meteorology of Edinburgh. Part III. By R. C. Mossman. Reprint from *Trans. Roy. Soc. of Edinburgh,* Vol. xl., Part III., 1902. Presented by the author.

Das Eiszeit Problem. Von Rudolf Credner. Sonderabdruck aus dem *Jahresbericht d. Geographischen Gesellschaft zu Greifswald,* viii., 1902. Presented by the author.

Exkursion nach Süd-Schweden am 20-24 *Mai* 1902. *Geographischen Gesellschaft zu Greifswald,* 1902. Presented by Prof. Rudolf Credner.

L'État de Californie. Par M. Paul Privat-Deschanel. Extrait du *Bulletin de la Société de Géographie de Lyon.* Presented by the author.

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United States Geological Survey Office, Washington.

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Survey Office of India.

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THE SCOTTISH

GEOGRAPHICAL

MAGAZINE.

THE GEOGRAPHY OF SOUTHERN PERSIA AS AFFECTING ITS HISTORY.

By Major P. Molesworth Sykes, C.M.G., Gold Medallist of the Royal Geographical Society.[1]

Southern Persia and Baluchistán lie between the rich alluvial plains and ancient civilisations of the Euphrates, Tigris, and Kárun on the west, and that of the Indus on the east. To the south, the land of Irán is washed by the Persian Gulf, which runs from NW. to SE., and is a most interesting body of water. Though proofs are still wanting, it is quite within the range of possibility that the art of navigation sprang into existence in this gulf, and that the pioneer ship of the mighty fleets of to-day painfully groped its way along these rockbound shores. Physically speaking, the coast is inhospitable, and the heat in summer is appalling. This latter fact must be remembered in connection with all schemes of development, the white man who resides on the shores of the Persian Gulf having to fight against a most trying climate. Additional disadvantages are the absence of good harbours and the fact that in the Persian Gulf there is always either too much or too little wind.

The coast strip runs back to range after range of rugged mountains increasing in altitude until the Irán plateau is reached. The fertile zone of upland country is not very wide, and it soon decreases in elevation, sloping down to the paralysing waste of the Lut.

The whole, indeed, can be best described as partly desert pure and simple, and partly desert tempered by oases. For instance, to the west, south, and east of Kermán there is desert, while at distances of a few miles, tiny hamlets, or in some cases villages, are kept alive by springs tapped in the hills, the water of which is laboriously conveyed for many

[1] An Address delivered before Section E of the British Association at Belfast.

Makrán Scenery :— From *Ten Thousand Miles in Persia*.

miles to the level plain by the underground channels termed *kanáts*; in some cases the original well may be 400 feet deep, and as every few yards other wells must be dug, it is impossible not to admire the patient industry of the peasant who gains a living in spite of great difficulties, a heavy shower of rain or a sandstorm frequently choking up the *kanát*.

Throughout the twenty degrees of longitude which separate the Indus from the Shatt-el-Arab, no navigable river reaches the sea. Many of the rivers indeed, chief among which is the Helmand, discharge their waters into inland lagoons. This is an important point as affecting history, but still more important is the NW. to SE. trend of the mountain ranges, which, it is to be observed, run parallel to the coast. As they are pierced by no waterways, they form a most formidable barrier to communication from the sea, whereas from Tehrán, the capital, to Baluchistán, the traveller marches between parallel ranges of hills and along wide valleys, which fact in every way facilitates trade and trade-routes of every description.

We now turn for a few minutes to the province of Baluchistán in which I have made several journeys. Baluchistán is the generally accepted nomenclature of a huge, thinly peopled country, divided between the British and Persian Governments. This desert province roughly corresponds to the 17th satrapy of Darius as mentioned by Herodotus. The Great King invaded the Hapta Hindu or the Punjáb, probably by the Baluchistán route, while a fleet under his Greek admiral Scylax descended the Indus, and, undismayed by the tides, explored the shores of Gedrosia and Arabia.

Baluchistán is termed Makrán throughout its coast regions, whereas the hinterland has no special name. Physically speaking, Makrán (see Fig.) consists of the district stretching inland as far as the watershed of the first important range of hills, and thus includes a strip of country averaging some sixty miles in width. For twenty miles from the coast there is a sandy plain traversed by several rivers, and often covered with tamarisk. Most of the rivers, except after rain, only run aboveground in parts, and then flow underground, which has the advantage of saving immense loss by evaporation.

Further inland the characteristics of the country are to a considerable extent similar to those of Southern Persia, except that the altitude of the mountain chains is not so great. As cultivation depends on irrigation, the absence of ranges sufficiently lofty to serve as storehouses for snow results in the encroachment of the Lut much further south. Indeed the eastern border of the Kermán province is separated from Baluchistán by a section of this desert some 200 miles in width, which is again an important factor in the history of Southern Persia.

I now turn to the Helmand delta (see Map), concerning the variable lower course of which I gained some interesting details when founding the consulate in Sístán nearly four years ago. Before describing this interesting example of what may be defined as the effect of history on geography, I propose to make a few remarks on this famous province.

Nishapur
Sharifabad
Kútur Kala
Shahrud
Asadabad
Bidar Pass
Turbat
Turshiz
Hendabad
Yunesi
Kal Sefid
Khaf
Khushk
Band i Turkistán
Murghab R.
Paropámisus
Kuhsan
Baba Pass
Bagwán
Sangal
Kasi
Gunabad
Jumeino
Bimurgh
Kalat
Kákh
Tun
Dasht i Naz
HERÁT
Kuh i Sufid
Harirud
KHORASAN
Nimbuluk
Tabas
Dihuk
Sedeh
Zenegun
Ab i Garm
Kuh i Naiband
Nasband
3400
Chenushk
Mukhteran
BIRJAND
Dar
Mud
Tabas
Sunnikhana
Ahangaran R.
Desert of Lash
AFGHANISTAN
Pay Pass
Farah
Farah Rud
Khásh Rud
Girishk
Chehel Pai
2130
Dirband
Bastran
Kala Zarri
Neh
Piradan
Lash
Juwain
Khadran
Gujar
Kubanan
Sebtran
Rawar
PERSIA
Nasratabad
Mian Kangi
SISTAN
Kuh i Khoja
Sh. Kuhan
Hauzdar
Jirin
Girdi Chah
Helmand or Hirmand R.
Yezdanabad
Zarand
Anár
Rafsinjan
Khuraman
Kuhpaya
5680
KERMAN
Khabis
1800
Kaunt Shimar
Mahain
Shimar
Kasir
Pariz
Mashiz
Nagar
13700
Hamuka
Bahramjird
Hamun i Shurgaz
Nasratabad
Ispi
3960
Kuh i Malik Sia
3362
Rahat Kala
Ziera
HELMAND DESERT
Baluch Afghan Boundary
Kacha Kuh
Nasun
Sundak
Amir Chah
Kuh i Shah
Ram
Darzin
Kuh i Sultán
caravan route
Bam
Hezar
13194
Rahbur
Sardu
Bam
Barez
Shurguz
Fahraj
Azizabad
Kuh i Taftán
Chehel Tan
12452
Kuh i Bazmán
11260
4500
Gih Kuh
Kigan
2290
Dasuri
Soghun
Dolutabad
Herisk
Rudbar
Bijenabad
Bazmán
Zirk kalat
Musbkel
Mud Volcanoes
1600
Tamin
Zindan
1486
Kuh i Jebal Barez
Kuh i Kuhbanan
Kuh i Jupar
Kuh i Kerman
Kuh i Lalezar
Kuh i Hezar
Kuh i Jiroft
Kuh i Kalagan
Kuh i Kamarij
Kuh i Dinar
Kuh i Sirjan
Kuh i Sarduiyeh
Kuh i Hajiabad
Kuh i Bidkhan
Kuh i Bidshahr
Kuh i Kuh Banan
Kuh i Kuh Gaz
Kuh i Kuh Shah
Kuh i Kuh Sefid
Kuh i Kuh Sefid
Kuh i Kuh Sefid

Sístán, that is to say, the lake and delta formed by the discharge of the Helmand and other less important rivers, was at some remote period one vast lake. Land was formed by the detritus brought down by the various rivers (of which the Helmand is by far the most important) along the northern portion of this lake, but this is now desert, while inhabited Sístán to the south was formed by the drying up of the lake itself owing to the decreased volume of the river, and perhaps also by the use of the water for purposes of cultivation.

Sístán of to-day has water on three sides for part of the year, the Helmand forming its eastern boundary, while to the north and west lies the *hámun* or lagoon (see Fig.). To the south-east of inhabited Sístán is situated the Gaud-i-Zirra or Hollow of Zirra, which is connected with the lagoon by the Shela, a watercourse 350 yards wide, with banks 50 feet high, where I crossed it. The great trough itself is at least 100 miles in length by 30 miles in width, and appears to have received either the whole of the present water-supply or the overflow of the old and greater flood; otherwise it is impossible to account for its vast area. The Shela runs in a briny stream when there is a large accession to the lake, and Captain Jennings describes the parallel waters of the Shela and Helmand flowing in opposite directions, with the lowest of sand-ridges intervening. Nowadays, as a rule, there is little more than a marsh in the lowest portion of the Gaud, not ten per cent. of its area being covered, even in springtime. If Ibn Haukal be correct, it would appear that in his day the Hirmand, as he always terms it, ran down to the Zirra Lake, which he describes as being 30 *farsakh* or about 100 miles in length when full. This would seem to settle the question.

I would now return to the Helmand, the classic Etymander. To summarise its courses, in the fourteenth century there was a solid dam known originally as the Band-i-Rustam and later as Band-i-Akwa (evidently a corruption of Afghán or Agwán). This was situated at a point on the Helmand some 40 miles east of the ruins of Hauzdár and at an equal distance from the limits of Sístán as it is to-day. A deep canal running west irrigated the fertile plain of Hauzdár, the main stream flowing north under the name of Rud-i-Nasru. On its banks were the famous cities of Shahristán and Záhidán.

Towards the close of the fourteenth century Sístán was invaded by Timur or Tamerlane, who destroyed the dam, and thus reduced the Hauzdár plain to a waterless desert. This action affected the Helmand, which, while still keeping to the Rud-i-Nasru, created a second branch encircling Sehkuha, which had not hitherto been inhabited.

There was apparently no other change until early in the nineteenth century, when the whole volume of water united to carve out a channel further east, to the west of the village and mound of Nád-i-Ali. As cultivated Sístán was thereby left high and dry, the Rud-i-Sístán was cut a little to the north of Sehkuha—a task of great magnitude. Such was the state of affairs when some thirty years ago Sir Frederic Goldsmid made his award, by which the river formed the boundary between Persia and Afghánistan, but, in 1896, the Helmand began to forsake the Nád-i-Ali channel and struck out a new course between it and the Rud-i-

The Helmand Lagoon :—From *Ten Thousand Miles in Persia.*

Nasru. This is now known as the Rud-i-Perián, and was a fine river when I crossed it on a reed raft in 1899. It is, however, anticipated by the greybeards of Sístán that the wayward Helmand will finally return to the ancient Rud-i-Nasru.

To conclude this brief survey, I would now refer to the Lut (see Fig.), perhaps the most salient characteristic of Persian physical geography. It is considered that in early times it was an inland sea, which theory is supported by the presence of the active volcano of Sarhad, the extinct volcano of Bazman, and many legends. But this is rather a geological question which I am not competent to discuss. Geographers have, without sufficient reason, I would urge, divided the great desert of Persia into two separate regions, that to the north being termed the Dasht-i-Kavir, the southern part being known as the Dasht-i-Lut.

The word *Kavir* is undoubtedly the Arabic word *Kafr*, which signifies a saline swamp, and is used in this connection in Southern Persia if not in the north. As regards the term Lut, the guides point out fantastic bluffs, resembling forts, mosques, or cathedrals, and explain that they are ruins of cities which the Almighty destroyed, as was the case with the cities of the plain from which Lot escaped with so much difficulty. This great waste of Persia thus has become associated and most appropriately, as I would maintain, with the name of Lot, Abraham's nephew.

After having made constant inquiries, I have come to the conclusion that the whole desert bears the one name of Lut, and that its saline portions are known as *Kavir* or *Kafr*.

This great desert stretches from a few miles out of Tehrán practically to the British frontier, a distance exceeding 700 miles, while from Tun to Pahra is about 500 miles. The easterly edge appears to be the highest, the village of Basirán, which I visited in 1899, lying at an altitude of 4800 feet. Tun is 4300 feet, and elsewhere the average elevation may be perhaps 2000 feet. Near Khabis the lowest levels appear to be about 1000 feet.

The worst portion of the Lut is that lying between Eastern Persia and Khabis, which was crossed by M. Khanikoff in the middle of the nineteenth century, and was twice traversed by Captain Galindo in the eighties. The former traveller writes: "Our delight at finding ourselves safe and sound can easily be imagined after crossing a desert unequalled in aridity on the whole of the Asiatic continent, for the Gobi and Kizil-Kum are fertile prairies compared to the Lut. I have seen the dreary aspect of the Isthmus of Suez. Many parts of that arid region seem struck with the same sterility as the Lut, but it never retains that character over such a vast surface." As M. Khanikoff possessed such a wide field for comparison, I think that his views may be accepted as final.

As I have crossed the Lut in many directions, my acquaintance with it may be considered to be somewhat extensive. Before coming to Persia the only desert I had seen was that of Suez, which is apparently an unlimited expanse of yellow sand. Not that vast tracts covered with yellow sand do not exist in the Lut, the interesting Seljuk column being situated in one of these level expanses. But in other parts are high mountains

The Lut :—From *Ten Thousand Miles in Persia*.

—I discovered one range with snow on its peaks in March—while again there are limitless wastes of gravel. In all cases, however, there is little or no drinkable water, so that these funereal wilds form a terribly formidable hindrance to communications, and thereby influence the countries which they embrace in a paralysing grasp.

To summarise, Southern Persia and Baluchistán have ever been comparatively barren countries, most difficult of access from the coast, and in consequence they have escaped invasion by sea, while Northern and Southern Persia have always suffered from the terrible Lut. Owing to the hardening influence of a livelihood wrested from a sterile soil, and perhaps still more to the superb climate, a warlike race was produced which frequently held in subjection the inhabitants of the rich, low-lying plains to the west, while, more than once, the martial hosts of Irán have swept all before them in the plains of India.

It is, however, with modern developments that I propose to conclude this paper, and I can give no better instance of my theme than that afforded by the Indo-European telegraph line.

Persia emphatically lies on the "Highway of the Nations," and when a land telegraph line to India was decided upon, there was no question as to the land of Irán lying across its route. Owing to the fact that at the end of the eighteenth century Shiráz became the capital of Kerim Khán, the soldier of fortune who carved out a kingdom for himself, the Bushire-Shiráz track—infamous though it is—superseded the routes from Bandar Abbas, which, geographically speaking, are by far the best, and were used by all travellers from the time when European ships first appeared in Eastern waters.

However, the Bushire-Shiráz-Isfahán-Tehrán route still remains the chief trade-route of Persia, and thus some thirty or more years ago the first telegraph line entered the kingdom of the Shah near Tabriz, and passing through Tehrán, followed this route to Bushire. From Bushire there are two cables which run the entire length of the Persian Gulf to Jásk, and from that village—the point where Englishmen first landed to open up trade with Persia in 1618—there is a land line which traverses the entire length of Makrán and joins the Indian system at Karachi.

A glance at the map will show that this line runs along two sides of a triangle; consequently it is not surprising that when in 1896 the undefined section of the boundary between Persian and British Baluchistán was finally delimitated by our president, Sir Thomas Holdich, under whom I had the honour to serve, ideas of a more direct line of communication came to be considered both desirable and feasible.

Already, in 1894, I had drawn attention to this subject, and in 1898 Mr. King Wood, of the Telegraph Department, accompanied me from Isfahán eastwards to reconnoitre the country for this purpose.

The extraordinarily regular NW. to SE. trend of the orographic system of Persia left no doubt as to the course to be followed for some 500 miles, so that from Kashán, where the present system is quitted, the new telegraph line will run down a wide valley to my headquarters at Kermán. From this city, the capital of South-Eastern Persia, the same

wide valley is followed as far as Bam and Narmáshir, which lie on the eastern edge of the Lut.

In 1894 I had discovered the village of Bazmán lying at the southern end of a volcanic range with a peak running up to over 11,000 feet, and as this practically bisects the desert, the telegraph line will be constructed to Bazmán. From this village its eastward course cannot be settled until it be decided whether Quetta or Karachi is to be its objective. But I think that the description I have given proves very fully how the direction taken across Central Persia has been entirely decided by the geography of the country.

TEN THOUSAND MILES IN PERSIA.[1]

It may not be inappropriate that the preceding article should be followed by some account of the work on Persia recently published by Major Sykes. Between 1893 and 1901 Major Sykes made many journeys in Persia, travelling throughout it northwards and southwards, and, both inland and along its southern coast, eastwards and westwards. His first journey was made in his private capacity as one who had felt the fascination of "romantic Irán." In the others, some of which included prolonged residence in certain districts, he was employed as an agent of the Government of India or the British Foreign Office. His official relations had reference chiefly to Southern and Eastern Persia. His wanderings in connection with them lay mostly, though by no means exclusively, in and around the extensive region reaching from the Kárun on the west to Beluchistán on the east, and from the Persian Gulf and Makrán coast on the south northward to the Lut and Sístán. They enabled him to obtain an intimate acquaintance with the geographical features and physical resources and condition of this part of Persia. He evidently acquired a complete command of the speech of the country, the most delectable perhaps of living Eastern tongues, and a large knowledge of its literature. With this was apparently combined a genuine liking for Orientals of the Persian type. He thus got into close touch with the people, gaining thereby a varied and trustworthy insight into Persian affairs. The result has been a really noteworthy book, charming in its narrative and descriptions, and replete with information of divers sorts concerning men and things—ancient, mediæval, and modern: the fruit not only of personal observation and experience, but of much literary and historical research and study.

We are, according to an oft-repeated commonplace, approaching the time when on this earth of ours no fresh domain will be found for the geographical explorer. But Major Sykes's work illustrates the contention that even in countries longest known to history there remains to the

[1] *Ten Thousand Miles in Persia, or Eight Years in Iran.* By Major Percy Molesworth Sykes (Queen's Bays), H.M. Consul, Kermán and Persian Beluchistán. London: John Murray, 1902. Pp. xv+481. Price 25s. net.

geographer a vast field for original investigation—boundless scope for the extension of geographical knowledge and for the recording of physical details hitherto unknown, or if known and observed, then forgotten or obliterated amid the changes and chances of human destiny. Among lands occupied by civilised man Irán is one of considerable antiquity. Races and dynasties have come and gone over its surface, and it still ranks as a civilised country. Yet in many places, more especially in South-Eastern Persia, the map was and is blank. By filling up a number of the blanks, Major Sykes has done valuable service to geography.

All of his geographical discoveries cannot be rehearsed here. But it may, for example, be noted that in his first journey he was able to locate a number of new orographical and physical features on his route across the Lut—a pilgrim route not before traversed by a European observer; and to illustrate the fact, often exemplified afterwards, that no small area in South-Eastern Persia is now waste, not from the infertility of the soil, but from want of irrigation. The limits even of the Lut include tracts once covered with prosperous villages and towns but now desert, because exterminating wars have swept off the population, and left the wells and underground irrigation channels to go to ruin. Again, Major Sykes's explorations in Sarhad, "the mysterious and dangerous" (the latter an epithet no longer fully deserved), has added much to our knowledge of a region which, abutting on British Beluchistán, lies in the line of land communication between India and Southern Persia. They likewise included a careful survey of Bazmán and its extinct volcano, and two ascents of the lofty Kuh-i-Taftán, with its active volcano of the Mádar Kuh, never before scaled by the geographical explorer. Not less important for the physical and historical as well as the political and commercial geographer, was his examination of Sistán and the Helmand Delta, the Gaud-i-Zirra, and the adjacent region along the frontier of Persia, Beluchistán, and Afghanistan. To these parts the trade-route from Quetta, which has for the present become an object of special care to the Viceroy of India, conducts its caravans before they proceed northward towards Meshed through the province of Kain. In continuation of his Sístán explorations that province also received a lengthened visit from Major Sykes. In recent years it has been traversed by other travellers. But he has brought to notice much new geographical matter respecting the distribution of the population and its agricultural and pastoral resources. In various districts of the province, village after village was discovered and added to the map.

Major Sykes, however, was much more than a mere explorer of the land surface and resources of Irán. He has also been a diligent student of its history from ancient times onwards to the present, and of the manners and customs, the art and literature of its people. Into all these subjects this article cannot attempt to follow him. In respect to geographical history, which more immediately concerns this magazine, it must be sufficient to say that the chapter in which he discusses the line of march taken by Alexander the Great on the return from the Indus to Susa, and the identification elsewhere in the book of districts and

places through which the Macedonian king passed, are among its most interesting passages. In Chapter XXIII. the route of Marco Polo, "the Father of Modern Geography," is described from the standpoint of one who has himself followed in the Venetian's footsteps. No references in the writings of early travellers and geographers to places visited by our author seem to have escaped him. Some of these give much relish and point to his pages.

The inhabitants of South-Eastern Persia are mainly of mixed race, and (the Sunni Beluchís excepted) of the Shia sect of Islam. Traces of an ancient Dravidian race are seen in Beluchistán, while the pure Iranians of antiquity in blood and creed are represented by the Zoroastrians or Parsís, considerable and by no means decadent communities of whom—descendants of faithful remnants from Moslem persecution—still exist in Yezd and Kermán. For the rest, the Mohammedan population consists of a mixture of Iranian, Arab, Mongol, and Turkish blood. The first is predominant in towns and villages, whereas the Nomad tribes are mostly of Arab, Mongol, and Turkish descent. Major Sykes has compiled lists of many of these tribes, together with the numbers of their families.

The golden age in the history of Irán preceded the Mohammedan era. At any rate, during the greater part of that era Persia seems never for any lengthened period to have been free from irruption by devastating and slaughtering hordes, or from internal dynastic struggles and disorders. The bewildering record of these, as they affected the south and east of Persia, Major Sykes has sketched. A little consolation on behalf of a region so much abused by human-kind may be derived from the fact that to-day order is fairly well maintained, and there is promise of it for the future. In some parts murder is still "a trifle, just like drinking a glass of water"; everywhere officialdom is inefficient and venal, and communications are difficult and hazardous. Yet the bulk of the people seem to live in comparative security, in the enjoyment of the fruits of their industry. But the pity of it, even in these days, is that possessed of great natural resources and of a people (Beluchís excluded) who are described as being "the finest and most gifted in Western Asia," Persia should be subject to a feeble and embarrassed, if not corrupt, administration. Except locally, where contact with Europeans or religious enthusiasm (as of the Bábís) has evoked them, aspiration after better things and the spirit of progress working for national interests are unknown. The impulse of advancement is little likely to come from within. The prospect of it, as of the continuance of Persia's territorial integrity, lies rather in her geographical position and the possibilities of profitable commerce and exploitation, which make her an object of desire and jealous solicitude to rival foreign nations.

What the interests of these nations, and especially of Great Britain, are in these matters, and the arguments bearing upon British policy, are set forth in the concluding chapter of the book. The author's attitude is perhaps rather too much that of one who has been called upon to justify the existence at all of a "Persian question" for Great Britain,

and in academic fashion to expound her various possible lines of action. It is, however, of the highest practical moment that the question should be looked upon by the British public as a really vital one, and that the difficulties, possibly the perils to empire and commerce, involved in it, should be fully kept in mind.

Major Sykes points out how for Great Britain as the paramount power in India, Afghanistan, and Beluchistán, the integrity and independence of Persia are an essential condition of freedom from political disquietude and burdensome military expenditure. But only in a somewhat incidental way does he advert to the grip which Russia has upon the Persian Government, firmer far now than when ten years ago Lord Curzon depicted it. He certainly does not emphasise it. That financially Persia is bound hand and foot to Russia cannot be blinked. The Shah is at present the Czar's debtor; he cannot for a long term of years accept financial help from any other power; he can grant no railway concession within his own territory without the Czar's consent; the only effective military force in Persia—the Persian Cossacks—is commanded by a Russian general, who, nominally in the service of the Shah, takes his orders from the Czar; all the principal routes into Northern Persia are dominated by the Czar, and Russian commerce is prevailing more and more in its bazaars. What has been the secret course of British diplomacy whilst the last of the engagements leading to this position of affairs has been carried through has apparently not been divulged. But it would seem to have contributed little towards the maintenance of that balance of power for which the British Foreign Office is declared to be anxious.

In the Conclusion and in the chapters on the Persian Gulf and the Kárun Valley, the author shows cause for believing that British commerce and political influence are still predominant in Southern Persia. It goes without saying that the waning of that ascendency by land or sea before any rival power would jeopardise in a measure not pleasant to contemplate the security of our Eastern dominion and commerce. This in fact is a political verity that cannot too often be borne in upon the British consciousness. It was forcibly enunciated not long since by Lord Cranborne in a passage quoted by Major Sykes which will bear requotation:—"It would be impossible for us (Great Britain), whatever the cause, to abandon what we look upon as our rightful position in Persia. Especially is it true in regard to the Persian Gulf. It is true not only of the Persian Gulf, but of Southern Persia and those provinces which border on our Indian Empire. Our rights there and our position of ascendency we cannot abandon." How far in the face of accomplished facts, and of the patient and persistent quality of Russian diplomacy working for a Foreign Office which has behind it the Minister of War and Finance, it will be possible to keep good these words, the future—possibly at no distant date—alone can show. But it may hardly be assumed in the case of this rival Power, at any rate, that having forced the northern door she will withstand the impetus to penetrate further, as far even as the other side of the house.

Meanwhile a good deal is being done, seemingly not without some

effect, to strengthen the British position in Southern Persia. The establishment of consulates in Kermán and Sístán, the encouragement given to caravan traffic *viâ* Quetta and Nushki, between India and Sístán and Khorasán, and between India and Kerman, the maintenance of order on and near the Beluchistán frontiers, are all contributing to influence South-Eastern Persia to our, as well as its own, advantage. It may be expected that British undertakings in Persia will in future receive all legitimate support from their country's diplomatic agencies; and Major Sykes, although he animadverts upon the British manufacturer's ignorance of commercial geography, commends the capacity and vigour wherewith our trading and shipping companies doing business in the Persian Gulf are carried on. He is not disposed to recommend the hasty expenditure of English money in schemes for the improvement of land communications inward from the Persian Gulf and its affluents. That is doubtless sage advice, provided it does not tend towards nothing being done. If little or nothing is done to open the way for southern traffic northwards, up the Kárun for instance, or from Bushire or Bandar Abbas, our great rival will not fail to make ways to push her northern traffic southwards.

The Government of India has projected an extension of the Quetta railway to Nushki, with a view possibly of taking it still further west. But the necessity for the immediate expenditure of a large sum of money in that direction seems doubtful. Here at least our author's motto, *festina lente*, appears to be apposite. The Nushki extension would cover a small proportion of the 500 miles—now mostly desert and never likely to be otherwise than sparsely populated—to be traversed between Quetta and Sístán. Major Sykes points out that that route to Khorasán is an artificial one from which traffic would be largely withdrawn were the Amir of Kábul to free from impositions and fear of brigandage (as is devoutly to be hoped he some day will) the route through Kandahar and Herát. After all, the highway to Southern Persia lies not across the deserts of Beluchistán along a line open throughout its whole length to interruptions from Afghanistan, but on the waters of the Persian Gulf through the ports on or within reach of its shores.

It remains to say a word or two on the outward guise of the volume. It is daintily bound and printed; the pictures are excellent, as may be seen from those we are permitted to use for the illustration of Major Sykes's article. In the headings of the chapters are reproduced beautiful ceramic, textile, and metal designs from objects in the author's collection. Among the pictures are three specially curious, about the source of which some readers would have been glad of more information: one at page 150, in which Alexander the Great is consulting "the speaking tree"; the others at pages 336 and 340, illustrating the ancient game of polo. The recondite disquisition upon that game in Irán, forming chapter XXIX, is a conspicuous instance of the diversity of Major Sykes's Persian researches and literary ability.

In the map appended to the book the various routes described are clearly marked. Otherwise the map is a somewhat poor one. The name *Shat-el-Arab* is misplaced along the eastern mouth of the Tigris.

The index is very complete, and its packed double columns occupy 23 pages out of the 481 contained in the book, being thus visible evidence of the amount and variety of the contents.

THE ARO COUNTRY, SOUTHERN NIGERIA.

By Donald A. Macalister.

The general character of the bush country, extending in a belt along the coast of West Africa, is too well known to admit of a minute description in speaking of the little-explored country of Southern Nigeria, yet it is of considerable importance to indicate, by a short account, the difference between it and the well-known centre of West Africa.

While serving on the Aro Field Force, operating recently in Southern Nigeria, I had considerable opportunity of gathering information regarding the country included in the sphere of operations of this force.

The Aro Country proper lies entirely in the bush belt, and occupies a tract of land lying between the Niger and the Cross rivers. On the north and south there are no natural boundaries, but roughly the country ends about the latitude of Itu on the south, and of Edima on the north.

The Aro people have long dominated the neighbouring tribes, and the power of this people's religion—Juh-Juh worship—indicates the submission of the neighbours to the Aro influence.

Aro men are tall and well developed. The features of this tribe, when compared with those of the average West Coast native, are rather refined, and they often display a sharpness amounting to cunning. The nose is not so flat as that of the coast native, for while wide, it is frequently aquiline, but the general cast is not that of the Haussa. The forehead of the thoroughbred Aro is very high and almost pointed. This shape is considered a mark of beauty, and it certainly gives the appearance of intelligence. I was informed that the women of the country often press the skulls of the infants in order that the forehead may become high.

The coarser types of Aro do not altogether resemble the ordinary negro, but are of a lighter colour with very distinctive, coarse features. The women are not handsome, although they spend considerable time over the coiffure, and the fashions for head-dress are many. Frequently the hair is parted in three or four parallel lines, so that there are as many ridges of hair, but the commonest custom is that of binding the hair into a long mass by means of clay and oil, or of tucking it into a basket net, giving the appearance of a sort of hat. Another common fashion is that of plastering the hair up into a comb by the same means.

Palm-oil seems to be the main export, but as a rule it is the outside trader who comes to buy—the Aro prefers to stay at home.

For the people's own consumption yams are cultivated in the clearings, and in order to insure good crops, fresh bush is cut away every season for the reception of the tuber. Palm-wine is used as a drink and from its fermenting properties enables the native to make bread

from imported flour. The staple diet consists of cow's and goat's flesh, chickens, yams, palm-oil, and fruit.

The coinage, as in other parts of the coast, is the brass or copper rod, the use of which is now being discouraged in favour of English money. During the rebuilding of the towns which were burned during the war, many of these rods were unearthed, having been buried for safety in preference to carrying so much burdensome wealth into the bush.

The houses are of the ordinary West African type, being mainly wattle-and-daub, but the floor is beaten clay, while, as a rule, there is a raised seat or couch of the same material in the main room. Many

Carved figure in front of Juh-Juh House, Arochuku.

of the so-called "Juh-Juh houses" are also the big meeting-houses of the town, and as a rule are simply decorated by wood-carving and rude designs; of this type of house I give two photographs. Invariably strings of skulls or bones of various animals were conspicuously hung inside. The ideal Juh-Juh house is that built solely for the idol itself. The house of the idol is a curious little structure seen in the open part of the town, or situated in the bush close by. It is not higher than five feet, and is in every respect like an ordinary native dwelling-place but for the fact that its walls are lattice, enabling the natives to see inside by stooping slightly. Inside there is a clay effigy (a Juh-Juh) around which lie various little offerings introduced through a little door. The Juh-Juh religion is of a somewhat complex character, but roughly

speaking it would seem that the power of the idol belonging to a man of influence is greater than those of ordinary folk. It would seem, too, that anything a native chooses to worship may be possessed by the spirit of Juh-Juh. The Juh-Juh (or medicine) is, however, mainly present in the act of sacrifice, or in letting blood, or in fact doing anything of a cruel nature likely to please the spirit. Juh-Juh is everywhere as evinced by the numbers of blood-smeared, carved images we found as we ransacked the houses for the lurking enemy at the taking of the Aro towns during the war. The Juh-Juh religion was extremely convenient to those in authority, for it remained with them to say what

Juh-Juh House, Bendi.

was required of the people to please their gods. It was employed in deciding the punishment of criminals, and had the power of life and death. Ruthless and ambitious chiefs, who were also frequently priests, employed the power to extort money from, or put to death, their victims. The former was commonly done, and, with regard to the latter, we may judge that human sacrifice was carried on to a certain extent, since many human skulls were found in the Juh-Juh headquarters. Atrocities were by no means uncommon, and it is certain that a stranger venturing into their country carried his life in his hands. One of the chief centres of Juh-Juh worship was Arochuku (formerly called Omochuku or Iboum).

One mile from Arochuku there is a shallow gorge reached by

following a narrow, tortuous bush path. It was in this place that the "Long Juh-Juh" (the Great God) was situated. A small river between steep, high banks flows through the gorge, and at this point widens out into a pool about thirty feet across, in the centre of which is an island. High up on either bank a dense bush, together with tall cotton trees, obscures the light. On entering this gloomy place, the first thing that caught the eye was the small island covered by a rude shelter, while gun barrels stuck into its bank all round made a sort of paling. At the end of the gorge, where the river enters, tiers of spherical clay vessels were stacked, while matting and cloths gave a ceremonial air to the

Great Palaver between Aro Chiefs and Sir R. Moore.

place. Gin bottles, cooking pots, human and animal skulls, lay about in disorder, a silent witness to the past orgies. A sacrifice of some sort was always in progress here, and when the place was first visited, it was being carried out by starving a white goat to death near the entrance to the place. A watch-house was situated in the bush a hundred yards back.

It was for the suppression of this state of things that the Aro Field Force was organised at Old Calabar, and a short but sharp campaign of three months sufficed to put an end to it. The towns belonging to the truculent natives were burned, and a wholesome lesson given to the inhabitants of the power of law and order. Many of the Aros were fearless,

but many again were frightened at the tactics of the white man, who came to them as a new power, for until now they had only heard by rumour that such men lived. During several actions it was easy to see that they feared our black troops much less than their white leaders. The districts surrendered one by one. On January 10, 1902, Sir Ralph Moore, the High Commissioner for Southern Nigeria, came up from Old Calabar to hold a grand palaver with the Aro people. This interesting ceremony took place in the open part of the town of Arochuku in the shade of the giant cotton trees. The Aro chiefs sat round in a wide semicircle and were addressed by our chief, who sat in the centre—his words being

Water-lilies in Enyong Creek.

communicated by an interpreter. The expressions on the faces of these simple-minded folk changed from that of semi-hostility to that of approval as the terms of peace and offers of friendship and good rule were made. Needless to say, the main points were the suppression of Juh-Juh worship and the acceptance of the white man's rule.

Many of the chiefs had amassed great wealth at Bendi—the most northerly town in the field of operations. A cave was discovered in the bush containing hundreds of pounds' worth of copper rods, together with guns and other weapons, war drums, tom-toms, and so on.

The climate of the Aro Country is similar to that of the rest of the coast, but the air is even more moist. The proximity of the Camaroon mountains seems to be a powerful factor in the production of rain, since

tornadoes or prevailing winds from that direction almost invariably bring heavy downpours. Owing to the amount of moisture in the air, the heat is very oppressive when such winds blow. Winds coming from the north, on the other hand, are dry, and carry impalpable dust from the great Sahara Desert, which hangs about all day as a haze obscuring the landscape. It is an extremely unhealthy country in its southern portions, especially round Arochuku, the Aro capital. At certain seasons of the year the country to the south of Arochuku is considerably flooded in the district round the Enyong river, a tributary of the Cross river. In the north the country is more elevated and hilly, while the bush becomes thinner, with scattered large fields of tall waving grasses, but there are still the clumps of large trees whose shade affords a good place for the native settlements.

In view of the schemes already afoot for laying out a railway from Lagos to Lake Chad, it would seem a fitting time to consider the possibility of opening up the tract of country between the Niger and Cross river by a small railway line. The country is certainly not too hilly to allow of a fairly level line to be laid without undue expense in bridge construction, but if the idea is entertained by our Government it would be better to follow approximately the course of the Cross river (avoiding the flood areas), both for economy in conveyance of material and for the advantages it affords in allowing of a straighter line to be built. It is certain, however, that there is access to the interior by way of the Enyong river which winds up north, and would provide a splendid outlet to the country, and promote trade in those remote centres, and in time a junction could be made at Lakoja with the Lagos line.

In addition to the prevalent and deadly malaria, there is the little "jigger"—a small insect which burrows into the feet, causing painful sores—while the guinea worm is also not uncommon.

It would be difficult to describe the geological features of the country after merely a flying visit, but occasional natural sections and cuttings show that the rocks differ in their upper layers from those in the better-known country behind Cape Coast Castle. The formations are largely hidden by forest and other organic refuse, which goes down to considerable depths. It has, however, the appearance of once having been the mouth of a wide delta. If there are any schists they exist at considerable depth, for in no case do they appear. Sandstones, varying in texture from a fine grained soft character to tough grits—occasionally thrown into anticlines—exist together with large pockets of mottled clay.

Laterite, the iron ore secreted by swamp algæ, exists in considerable quantities and of different characters, and I have no doubt that it is from similar minerals that the native iron is produced. Limestone is not met with, but I found transported blocks in the town of Edima, two days' march from Arochuku; these are used by the natives as footstools.

I was unable to collect much information regarding the fauna of the district, but the lower reaches of the river swarm with crocodiles which make splendid scavengers. Hippopotami are common on the Cross river, but elephants do not come so far south.

Mr. Charles O. Waterhouse, of the Natural History Museum, London, tells me that the most interesting specimens of insect life I secured were: (1) A member of the Cleridæ (Genus *Cylidrus*): the only other specimens known are from Zululand, Natal, and Zambesi. (2) A longicorn beetle belonging to the Prionidæ (Genus *Macrotoma*). Only one other member of the genus, described as *M. novem costata*, has been found in Angola, but it differs slightly from the West African specimen.

THE IRRIGATION OF EGYPT: WHAT THE BRITISH HAVE DONE.

In June 1901 an article appeared in this Magazine reviewing a paper on the British in Egypt, contributed to a Paris journal by M. Jean Brunhes, Professor of Geography in the University of Fribourg, Switzerland, and in the Collège libre des Sciences sociales at Paris. Professor Brunhes has recently published an important work, entitled, *L'Irrigation, ses conditions géographiques, ses modes, et son organisation dans la peninsule Ibérique et dans l'Afrique du Nord.* (C. Naud, Éditeur, 3 Rue Racine, Paris, 1902. Pp. 580, with 7 maps and 63 illustrations.) The work is divided into three parts—Spain, Algeria-Tunisia, and Egypt. Space will not permit of our reviewing the first two parts, but we may observe that the whole work is the result of patient personal observation and study on the part of the author, who visited Spain in 1894-95 and in 1900 as "pensionnaire de la Fondation Thiers," and Algeria-Tunisia in 1899-1900 charged with a scientific mission by the French Minister of Public Instruction, who also sent him in 1899 to study irrigation in Egypt.

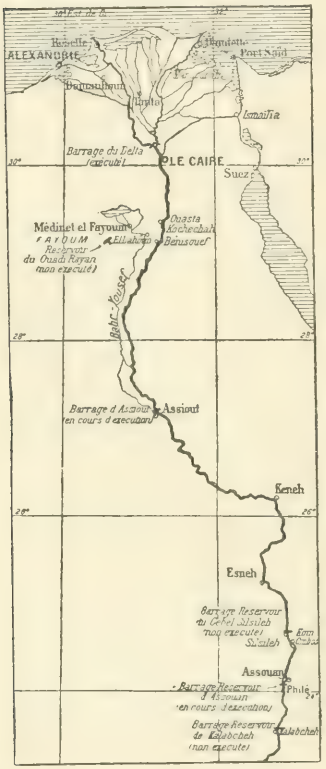
Selecting Cairo as the centre of his observations, Professor Brunhes found there very useful libraries and scientific societies (notably the Egyptian Institut), and also many heads of departments who willingly assisted him and who granted him every facility to visit all the leading examples of irrigation in Egypt from Alexandria to the Second Cataract of the Nile. He was likewise enabled to study the zone bordering on the Suez Canal.

"The Nile is nothing but a gigantic oasis in the midst of the Sahara. But the Nile draws upon Equatorial reservoirs, and affords Egypt such a volume of water that in spite of the rarity of rains, notwithstanding desiccating winds, etc., its Egyptian banks bear real tropical plants, cotton, and the sugar-cane." Thus Professor Brunhes commences his interesting study.

He points out that the year 1837 is an important date in the history of the utilisation of the water of the Nile, for it was then that Mehemet Ali introduced *irrigation*, whereas previously the method followed had been *submersion*. Under the Pharaohs the land had been inundated by a double system of basin-forming dams, the one class parallel, and the other perpendicular, to the course of the river. When the Nile rose, its waters entered these basins stretching along the side of the river, and each basin

emptied into the one below it, all thus preserving the water for some weeks. This system of submersion is still employed over a large part of Middle and Upper Egypt.

Mehemet Ali introduced the system of irrigation first of all in the Delta of the Nile, and there in 1843 Mougel Bey, a Frenchman, began the great "Barrage," about fourteen miles below Cairo, the object of which was to retain the waters of the Nile when it rose and enable them to be distributed afterwards at leisure. This "Barrage" was partially executed and then abandoned, but British engineers of the Egyptian Irrigation Department, under the direction of Sir Colin Scott Moncrieff, finally repaired and completed it between 1886 and 1890.



Sites of the principal Dams and Reservoirs constructed or projected in the valley of the Nile in Egypt. (Scale 1 : 10,000,000.)

As irrigation has subjected the water of the Nile to double demands, both as regards time and space, the result has been to render the quantity of water insufficient. In short, there is a want of water in Egypt. Professor Brunhes therefore inquires, "What have the British done during the past twenty years?" and replies, "They have projected and carried out two works arising from the same cause and necessity, and which are linked the one to the other:—

"1st, They have endeavoured to place in reserve a part of the annual rise of the Nile by means of dams and reservoirs. This is their *technical* work.

"2nd, They have laid the foundations of a legislation and system of regulations which will assure the best distribution and the most complete economy of the available waters. This is their *juridical* and *administrative* work."

The system of irrigation, having been substituted for that of submersion, is becoming more general, and the Irrigation Department is actively engaged in organising it throughout all Egypt. Already in Middle Egypt great works like the construction of the dam of Kochechah have succeeded in preserving for the natives the waters of the high Nile; but if we remember that the great object of irrigation is to enable people to have water at their disposal all the year round, and especially during the dry months of February, March, April, and May, we must confess that the only parts of Egypt enjoying completely the advantage of what the Department calls "Perennial Irrigation" are the Delta and the Fayoum. Professor Brunhes gives a detailed and masterly account of

the irrigation of these districts of Egypt, and adds an interesting map illustrating the irrigation and drainage of the Fayoum, "one of the little corners of Africa having the most extensive literature" from Herodotus, Strabo, Diodorus Siculus, and Pliny onwards. Numerous photographs by himself also illustrate the irrigation of the Fayoum.

Professor Brunhes states that we may affirm without exaggeration that within a period of seventy years the population of Egypt has increased from two to ten millions. Thus Labour is easily obtained. At the same time the great increase of population raises the question of food-supply, and, when the Nile is low, as in 1900 and 1901, that question becomes a serious one. The author then carefully considers the works

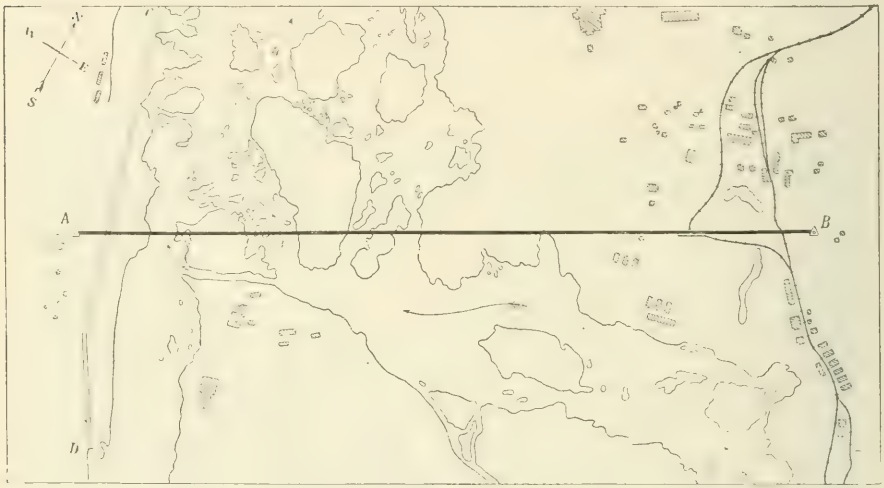
View of the entrance to the First Cataract of the Nile, taken from the island of Philæ. The elevation in the background corresponds roughly with the site of the great Assouan Dam. (Photographed by Professor Brunhes in February 1899.)

executed or projected by the British, and the methods followed by them in order to meet the difficulties of the situation.

The first of these works was that undertaken and successfully carried out by that distinguished Scotsman, Sir Colin Scott Moncrieff, under whose direction the celebrated Grand Barrage of the Nile, situated a little below Cairo, was between 1886 and 1890 repaired and perfected and made for the first time to assist irrigation in a completely satisfactory manner. A fine photograph of this Barrage was taken by the author and is reproduced in his work.

Another eminent British engineer, Mr. W. Willcocks, having been commissioned by the Egyptian Minister of Public Works to report on the best place for another great Barrage or dam, devoted four years (1889-1893) to the investigation, and arrived at the conclusion that the most

advantageous situation would be at the First Cataract of the Nile near Assouan and below the Island of Philæ. An International Commission having examined and approved of this suggestion, that well-known British contractor, Sir John Aird, M.P., undertook the work, the greatest of the kind that had ever been projected, at a cost of £2,000,000, to be gradually advanced by a group of London bankers consisting of Sir Ernest Cassel and Messrs. Hirsch, Karl Meyer, and Rothschild. The first stone of this Assouan dam was laid by H.R.H. the Duke of Connaught on 12th February 1899, and the work will be finished during the present year, 1902. Numerous photographs, by Professor Brunhes, and woodcuts illustrate this most important and beneficent undertaking, which will enormously increase the food-supply of Egypt. The author



The First Cataract of the Nile near Assouan, showing the approach to the Cataract.
A B=Site of the great Dam of the Reservoir. *C D*=Navigable Canal proposed. (Scale 1:20,000.)

warmly re-echoes the words of Mr. Willcocks: "The Assouan dam is an achievement of a type without precedent on this earth. If this undertaking succeeds, it will mark an epoch in the construction of dams. There must be positions on the torrential rivers of arid or semi-arid regions in South Africa, Australia, and North America, suitable for dams like that of which the Assouan dam furnishes the unique example and which would supply a long-felt want."[1]

Professor Brunhes then passes to another great British achievement—the Barrage of Assiout, midway between Assouan and Cairo—and points out that the British have also executed in Upper and Lower Egypt numerous smaller works, such as the Regulator of Nazlet El Abid (province of Minia) and the Barrage of Kochechah, midway between Assiout and

[1] It is estimated that the Assouan dam will create a body of water equal, in area, to the Lake of Geneva. Similar Barrages are now spoken of in connection with rivers in Australia, a country which has suffered disastrously from drought during the past seven years.—R. R.

Cairo. He says the British authorities in Egypt wisely placed their Nile works under the direction of engineers who had mastered the difficulties of irrigation in India, such as Scott Moncrieff, Brown, Wilson, and Willcocks, for such men were accustomed to know the worth of water in a country where water is everything, and worked diligently and intelligently until their operations were brought to a successful conclusion. The author is of opinion that "it was necessary to substitute for the omnipotent, arbitrary, and capricious Khedivial government," which existed before the British occupation, "a central organisation, in order to assure a wise and regular control of all the agencies which now utilise the waters of the Nile."

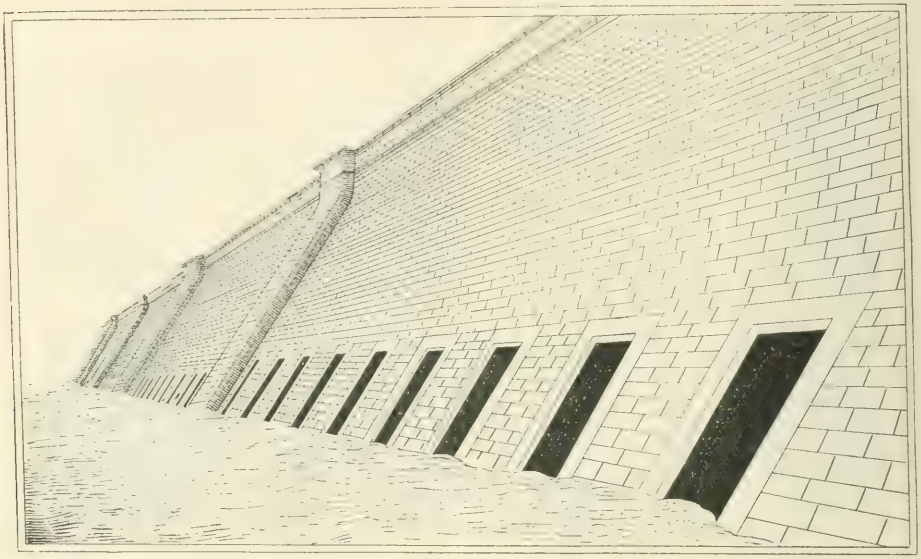
In 1883 (the year after the bombardment of Alexandria) the British

The Foundation Stone of the great Dam of the Barrage-Reservoir of Assouan.
(Photographed by Professor Brunhes eight days after the official laying of the Foundation Stone by H.R.H. the Duke of Connaught on 12th February 1899.)

created the Irrigation Department of Egypt, and in 1890 an order was issued declaring *all* the canals public property and to be maintained at the expense of the State. The *corvée* was officially suppressed, but, on special occasions, forced labour is necessarily still employed, as when villages have to be protected against inundations. In the same manner the water used is paid for indirectly if not directly. The lowest Nile known, since the Nilometer was used, was in 1900, and the Irrigation Department was taxed to its uttermost to meet the situation involved. The author represents the Under-Secretary of Public Works, Sir W. Garstin, writing a masterly report on the situation "with that phlegmatic dignity which never leaves the British even under the most trying circumstances." The practical conclusion of this report was that all water had been reserved for the cultivation of cotton in preference to that of foodstuffs, such as rice and maize, and that whilst the rice had not been altogether sacrificed, the maize had been abandoned to its fate. It

is the cotton crop which is the most remunerative, and which occupies the first attention of all the great capitalists engaged in the Egyptian trade, and the author thinks that if the rise of the Nile had not proved better than Sir W. Garstin imagined, the fellaheen might have suffered from the cultivation of foodstuffs being sacrificed to the cotton crop.

Professor Brunhes's conclusions on the irrigation of Egypt under the British administration are well worthy of study. The arbitrary and capricious authority exercised by Mehemet Ali and his successors has given place to the precise, regular, and scientific control of the waters of the Nile by the British administrators of Egypt. The sustained energy



The Barrage-Reservoir of Assouan, showing the great Dam when completed.

and the all-powerful protection of British agents have unofficially but effectively been the real heir of the arbitrary authority of Mehemet Ali. This central power has undertaken the gigantic task of distributing intelligently the annual Nile flood, and the vast projects of irrigation have received new life only by that power, acting in the name of Collectivism, having become established anew.

On the other hand, the author acknowledges that the British were the only European people capable of sufficient boldness to play the part of great distributors of water and of sovereign dispensers of fertility and riches in a country which did not belong to them, and which could not officially belong to them. We must once more remember the influence which the British possession of India has had on the affairs of Egypt. India has afforded the British that experience which made them appreciate the value of water, and it was India which furnished to Egypt all the leading British engineers of her Irrigation Department.

Professor Brunhes concludes his remarks as follows: "Whilst French engineers have scattered over Egypt fertile ideas and ingenious designs, and whilst they have had great achievements, they have not made one work. They had never lived in a country where water was everything. They were industrious engineers of the "Ponts et Chaussées" class, calculating theorists, and able practitioners, but they were never more, and could never be more, than men of great barrages and great masses of masonry. They were not, and they could hardly ever become, the despotic organisers of water.

"The British engineers who came from India were qualified by habit and experience, even more than by nature and temperament, to establish

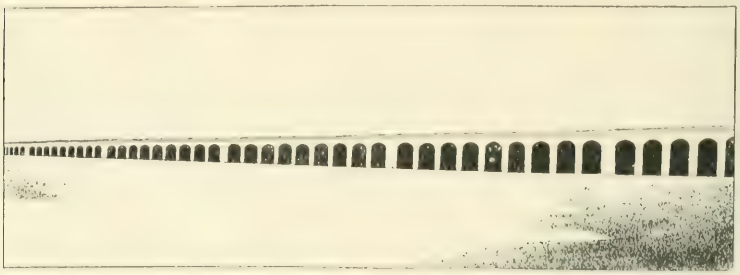
Commencement of the works on the Nile Dam at Assiout.
(Photographed by Professor Brunhes in February 1899.)

an irrigation service which should be at once altogether independent and strongly centralised. To this end they gave their first care, their first efforts. With the so-called liberal economic ideas which have so long exclusively governed his official schools, a Frenchman could not conceive this future *rôle* of the sovereign service of irrigation except as a usurpation of power. Britain, the would-be country of liberal ideas, which has always had the cleverness to recommend to the world the ideas which would best serve her own interests, never troubled herself about applying liberalism towards foreign peoples, and had no hesitation in planting herself in Egypt, and, by becoming mistress of the Nile, becoming mistress of water also.

"To-day British capitalists, contractors, and engineers, have united their efforts in order to endow Egypt with a reservoir containing a

milliard of cubic metres of water above Assouan. From Assouan the intention is, so to say, to launch the water of the Nile over those districts which are desired to be watered, and on the exact places which are wished to be fertilised. This great reservoir-dam of Assouan shortly to be inaugurated is at once the crown of the work begun twenty years ago and the most striking symbol of the influence achieved and exercised by the Irrigation Department.

"The waters of the Nile, superabundant in the days of the Pharaohs, can only with great difficulty satisfy all the new requirements. For example, Mr. Willcocks declares that 2000 millions of cubic metres of water more than at present are necessary to meet the demands now made by fields actually under cultivation. We have passed from the old type of an arid region where water is abundant to a type in which the water must be distributed with scrupulous care, and where it will never suffice unless it is nicely portioned out. The State, representing Collectivism,



The Nile Dam at Assiout, when completed.

must control this distribution, and does do so with greater attention than ever, and must continually superintend the use each one makes of the water. Whilst Egypt of the Pharaohs belonged to the irrigation type of Granada in Spain, modern Egypt belongs more and more to that of Valencia.

"The influence of geographical conditions is such that men unconsciously pursue those economic forms which alone can save them from poverty and ruin. In spite of the dimensions of Egypt, notwithstanding the difficulties of a general organisation, in spite of the absence of historical traditions relating to this subject, notwithstanding the natural current of modern European ideas which influence the Egyptian Government, and in spite of the difference betwixt the existing political system and ancient systems, we find, born to-day in Egypt, an authority and an organisation which are altogether analogous in their object and in their effect to the government and the organisation of water which existed in the old *huerta* (or irrigated territory) of Valencia in Spain."

It is gratifying to note that whilst, as regards, all British things in Egypt, the French usually prove the most exacting of critics, Professor Brunhes feels himself compelled, by the greatness, beneficence, and excellent organisation of the British Irrigation Works in Egypt, to

bestow upon the British authorities an unstinted meed of admiration and praise. R. R.

(The Illustrations accompanying this paper have been kindly furnished by M. Naud, Paris, the publisher of Professor Brunhes's work.)

SOME NOTES ON THE BONIN ISLANDS.

By W. B. Mason, Corresponding Member for Japan.

Steamers run monthly between Yokohama, Hachijō, and the two main islands of the Bonin Group. Once a year, in summer, the boat calls at various others of the long chain of green isles and barren rocks that stretch almost in a straight line from Vries to the Volcano Islands. Japan claims jurisdiction as far as Minami Torishima (Wake Island),[1] in Lat. 24′ 15″ N. and 154′ E. Long., about 650 miles ESE. of Hahajima or the Coffin Group.

The Bonin Islands consist of three distinct groups lying between the parallels of 26° 30′ and 27° 45′ N. Lat. They are of volcanic origin with a fringe of coral. The most northerly cluster was named Parry's Group by Captain Beechey, R.N., who visited the Bonins in 1827. The central and largest group includes Otōto-jima (Stapleton Island), Ani-jima (Buckland Island), and Chichi-jima (Peel Island), while the biggest member of the southernmost cluster (Coffin or Bailey Islands), is now known as Haha-jima. This last lies 580 miles due S. of Yokohama. The Japanese names are given on an original system. *Chichi-jima*, which means "Father Island," has near it the Islands of the Elder and the Younger Brothers (*Ani* and *Otōto*), while the islets round *Haha-jima* or "Mother Island" are termed Sister, Niece, etc., and the northernmost group includes the Bridegroom, the Bride, and even the Matchmaker.

The Japanese claim to have discovered the Bonins in the latter part of the sixteenth century, and to have kept up fitful communication with them down to 1863, though formal possession was not taken until 1875. Their general name for the archipelago—Ogasawara-jima—is derived from that of the Daimyō, whose followers discovered it. Our word "Bonin" is a corruption of Jap. *munin*, which means uninhabited. Some maps give another name—Arzobispo—which is derived from old Spanish charts.

From 1827 onwards the Bonins began to be inhabited by shipwrecked whalers and other waifs and strays from Hawaii and elsewhere,

[1] This island was lately the cause of considerable discussion in the Japanese and American press, the U.S. Government having advanced a claim to the ownership; but as the Japanese officially annexed it in July 1898, and as the only inhabitants are Japanese engaged in collecting guano, the claim has been withdrawn. The Torishima (Bird Island) here alluded to is not the island of the same name which has just met the sad fate of Martinique). This unfortunate islet, at which I touched last summer, lies in 30° 28′ N. Lat. and 140° 14′ E. Long., some 200 miles north of the Bonins.

who brought Kanaka wives with them. These and their descendants, to the number of about seventy, formed the sole population till the advent of the Japanese, who now number nearly 6000, and have founded a regular government, introducing schools, posts, roads, and other elements of a civilised community. The sugar industry has been largely developed, and sugar is now the chief article of export; some trade is also done in canning turtle and pine-apple for the Tōkyō market.

The half-caste settlers, who all speak English, remain on, as Japanese subjects, in their old holdings, and continue to live in cabins, thatched with the leaves of the cabbage palm. Many of these men spend the summer months sealing in the North Pacific. Most of the children now

Port Lloyd (Chichi-jima).

attend the Japanese Government Schools. These English-speaking settlers are Christians, and one of their number has been licensed by the Bishop of South Tōkyō to act as their catechist and to carry on missionary work among the Japanese.[1]

The vegetation is tropical and luxuriant, including pine-apples, bananas, lemons, and oranges. No snakes or other venomous reptiles exist, and but few birds or butterflies;[2] but cockroaches and ants are everywhere a plague. A species of bat is found measuring some three

[1] Further details about the history of the Bonin Islands and the early settlers there may be found in Captain Beechey's *Narrative*, vol. ii. chap. xviii., in Commodore Perry's *Narrative*, vol. i. chap. x., and in vol. iv. of the *Japan Asiatic Society's Transactions*, 1876 ("A Visit to the Bonin Islands," by Mr. Russell Robertson).

[2] Seebohm, in an article on the birds of the Bonins, says that after the winter visitors have been eliminated there remain only fifteen residents; and after further eliminating ocean birds with ranges of considerable extent and Japanese birds, he found but eight species peculiar to the Bonins.

feet from wing to wing. The sea swarms with sharks, and the coast is visited by large turtles, which are caught by men from canoes.

Passing Parry's Group—a number of fantastically jagged rocks—and leaving Otōto and Ani-jima on the left, the steamer enters the beautiful circular harbour of Chichi-jima, formerly known as Port Lloyd, apparently the crater of an ancient volcano. Of the numerous abrupt hills, all thickly wooded, that rise on every side, the highest is Asahi-yama (880 feet), at the east or upper end of the harbour. Behind a stretch of yellow sand on the NW. side stands the village of Ōmura, the seat of the local government. Most of the foreign settlers live at Okumura, a little to the NE. On the opposite or S. side is Ōgi-ura, the only other fair-sized village.

Haha-jima, which lies 35 miles to the south of Chichi-jima, is some 7 miles long by 1½ miles broad. It has no harbours. The steamer anchors some two miles off the village of Okimura, which lies in a shallow bight with a picturesque approach. Though the island is hilly (highest point 1470 feet) and rockbound, its numerous valleys, well adapted for sugar cultivation, make it the most flourishing of the whole archipelago. A large breed of cattle find good grazing ground in the southern part. These animals furnish a rough amusement to the inhabitants by a peculiar kind of bull-fight in which men take no active part. The beasts are led into an arena until their heads come close together, and the ensuing contest is one of brute strength. Victory is declared, as in ordinary Japanese wrestling, by the weaker being pushed outside the ring, or a throw may sometimes even occur by the two pairs of horns becoming interlocked. Little injury is allowed to be inflicted.

The highest temperature during the three years (1897-1900) did not exceed 95° F., whilst the lowest registered was 48° F.

The population of the twelve islands included under the denomination of the Ogasawara Islands is: Japanese, 5450, of whom 3086 are men and 2364 women; foreign settlers, 100, of whom 43 are men and 57 women.

Professor Yoshiwara, with whom I made the tour, and who was specially sent by the Imperial University of Tōkyō to investigate the geology of the islands, has kindly furnished me with the following interesting note. He says: "All the islets of the Ogasawara Group show the same geological formation. The chief rock in the Chichi-jima sub-group is agglomerate tuff alternating with andesite lava. . . . These two sub-groups (Chichi-jima and Haha-jima) are typical submarine volcanoes, sending out numerous streams of lava by subsequent eruptions after frequent periods of repose. Thus the submarine volcanic eruption of the Ogasawara Group began in the Eocene epoch, and had already ceased before the Miocene. This old volcanic chain must therefore be separated from the Fuji chain, which is younger Neogene, or partly even still more recent in origin. No indisputably Eocene volcanoes corresponding to the age of this chain have yet been found in Japan."

GEOGRAPHICAL NOTES.

EUROPE.

The Dunes of Belgium.—The coast-line of Belgium is fringed throughout by a belt of sand-hills, which has a length of about 70 kilometres and a varying breadth. At the lighthouse of Knocke the breadth is no less than 1500 metres; it diminishes towards Heyst, and between this town and Blankenberghe is only 40-50 metres. This diminution is continued towards Wenduyne, where the zone is reduced to the condition of a mere embankment. Thence towards Ostende it again widens to 900 metres, is flattened out between Ostende and Mariakerke, while from Mariakerke onwards to the French frontier there is, roughly speaking, a continual increase in breadth to the maximum of about 2300 metres. These variations are sufficiently well marked to make them worth careful study. They seem to be due to the combined action of wind and waves. Where the dune-belt reaches a considerable breadth, the hills form little chains, separated by damp depressions called "pannes." The mean height of the dunes is about 15 metres; the highest, situated near Nieuport, is 30 metres. They are not composed of pure sand, for the soil contains small amounts of nitrogen, phosphoric acid, and potassium salts; in some localities, especially near the French frontier, the sand is calcareous, and has in places by the action of water been converted into calcareous grit. At the base of the dunes is a layer containing water of good quality, but the water found in the "pannes" is absolutely undrinkable. As is also the case in the north of France, it is found that the sea-coast is the region where the rainfall is lowest, the mean being only 600 millimetres.—*La Géographie*, vi.

Chronology of Glacier Variation.—M. Charles Rabot has published an interesting note on this subject, amplifying his previous results, which we have already noticed in these pages. His study, alike of northern and of Alpine glaciers, leads him to the conclusion that the variations of glaciers may be arranged in two categories, first, the large or primary variations; and second, the small or secondary variations. Those of the first type affect the whole of the glaciers of the region in which they occur, they lead in the Alps to a displacement of the anterior end of the glacier which varies in extent from one to two kilometres, and their duration is more than half a century. In the second category are included variations which are of limited duration, of slight amplitude (in the Alps 3-400 metres), and are of very limited extension in the country in which they occur. M. Rabot gives a chronological table of the primary variations in the Alps from the beginning of the seventeenth century to the present time, with some notes on the known variations of the northern glaciers. An interesting corollary from his observations is the prophecy that a period of increase of the Alpine glaciers will set in within a few years, probably in 1907.—*Archives des Sciences Physiques et Naturelles*, 14.

Meteorology of Edinburgh.—We have received Part III. of Mr. R. C. Mossman's memoir on this subject (*Trans. Roy. Soc. of Edinburgh*, vol. xi. 3). The present instalment contains new monthly and annual averages for the ten years 1891-1900, the fifty years 1851-1900, and for longer periods, which embrace 137 years in the case of mean temperature, 131 years for mean barometric pressure, 130 years for the non-instrumental phenomena, and 124 years for rainfall. Other tables are also included, and further additions have been made to the chronological list of remarkable atmospheric and celestial phenomena. A plate shows

the departure from the mean values of solar radiation in Edinburgh from 1889 to 1898.

AFRICA.

Mission to Lake Tchad.—Through Reuter's agency there has been communicated to the daily press an account of the British expedition recently sent out with the object of establishing effective occupation of the region lying between the Niger and Lake Tchad. The prime object of the expedition in its earlier stages was to put down slave-raiding in the Bautchi country, and this was accomplished without difficulty. From Bautchi the expedition directed its steps to the north-east towards the lake. On the road to Gombe the force passed through the fertile valley of the Gongola, where the country is open, and affords grazing to large herds of cattle. After leaving Gombe, Mallam, the great slave-raiding leader, was captured. Between Gujba and Maiduguri, open country was traversed, containing scattered villages, inhabited by low-class Mohammedans, and at Maiduguri good water was found, and a post established. On continuing the journey an Arab country was entered with populous villages but a scarcity of water. Eventually a small Arab encampment was reached, which was thought to be on the shores of the lake. To the disappointment of the party, however, it was found that although the spot marked the shore at the wet season, at this, the dry season, the waters were still fourteen miles distant. When the lake was finally reached, it was found that hippopotami and alligators were abundant, while on the shores were herds of antelope, and all around great flocks of birds. The islands of the lake are inhabited by a race of cannibals known as Badduma, who have never been seen by white men. They are greatly feared by the people of the shore, who will not venture near them. The nearest island is some seventy miles from the shore. The water of the lake was found to be quite fresh, but the wells in the vicinity were very salt. The shores of the lake are very fertile, and grow tobacco, cotton, and onions. From the lake the party marched to Kuka, and subsequently returned to Maiduguri. On the return journey, active opposition was encountered from the hill cannibals of the Bassama country. These people are said to have features very like those of the American Indians, and ride bare-backed horses; they wear no vestige of clothing, and fight with poisoned arrows and spears.

British Central Africa Protectorate.—The report of Mr. Sharpe, Commissioner of this Protectorate, has been recently published by the Foreign Office (*Diplomatic and Consular Reports*, 2872). On the whole the condition of the Protectorate is satisfactory. There was a decrease in the coffee production last year, but it is estimated that the present year will prove a specially good one. Tobacco has increased in amount. It finds a ready market in Rhodesia, and it is hoped that ultimately it may also find acceptance in the home market. The export of rubber has decreased, owing to the exhaustion of the area of production. The amount of rice under cultivation has increased, especially on the shores of the lake, and there is a considerable local market for it. The roads have been greatly improved, and efforts are being made to facilitate the transport of goods. Game is abundant and not decreasing, save in the immediate neighbourhood of European settlements. A considerable amount of wheat is grown, and excellent flour is produced, which finds a ready sale among the Sikhs and Europeans. The condition of the natives is satisfactory, the country being quite peaceful, while military service has become very popular with the natives. The health of the Europeans in the Protectorate is more satisfactory than formerly; malaria is decreasing, and the mortality of blackwater fever has diminished.

Gordon Memorial College at Khartoum.—This college, which Lord Kitchener opened recently, is now ready for the Chemical and Bacteriological Research Laboratories presented by Mr. Henry S. Wellcome during his recent visit to the Sudan. The fixtures and appliances made in England have already been shipped. The equipment for scientific work is most complete in every detail, and will be equal to any similar laboratories in Europe.

The Sirdar has appointed as Director of these Research Laboratories, Andrew Balfour, M.B., B.Sc., D.P.H., of Edinburgh, whose work in Bacteriology is well known in professional circles.

The Sudan presents exceptional opportunities for the study of tropical diseases, especially malaria, typhoid, and dysentery, and it is anticipated that the results of the investigations of Dr. Balfour and his staff will be of the greatest importance. Dr. Balfour will also assist the authorities in the investigation of the criminal poisoning cases which are very frequent in the Sudan. The character of the poisons used by the natives is at present often obscure, and it is possible that the work in these laboratories may considerably increase our knowledge of toxic agents.

Apart from the original researches and general sanitary work, Dr. Balfour and his staff will devote their attention to the study of the cereals, textile fibres, and various matters affecting the development of the agricultural and mineral resources of the country.

AMERICA.

West Indian Eruptions.—Dr. H. A. Alford Nichols gives in *Nature* some notes on the outbursts of activity on the part of Mount Pelée which took place at the end of August, and culminated in the disastrous eruption of August 30. Dr. Nichols is of opinion that the eruptions have been caused by the sea obtaining access to the reservoirs feeding the volcanoes, and states that the discharge of steam and hot water accompanying the late eruptions has been much greater than in the case of the earlier ones. The eruption of the 30th was preceded on the 28th by a magnificent electrical display, the zigzag flashes of lightning being accompanied by reddish globes of fire which ascended and exploded, shooting out stars and long rays. The fall of ash on the 30th and following days was heavy. The destruction of lives and property at Morne Rouge and Carbet was very great, and was produced by hot ashes and water. There has apparently been a considerable alteration of the bottom in the Caribbean Sea in the vicinity of the volcanoes, but as yet the cable between Dominica and Martinique has not been repaired, and the exact amount of change in the vicinity of Mount Pelée has not been ascertained.

Irrigation in the United States.—A *Times* correspondent gives an interesting account of the Newlands Irrigation Law, recently passed by Congress, and its probable effect on land-reclamation in America. The need for artificial irrigation in the States has become gradually more and more urgent, as the lands upon which crops can be grown without its aid have been gradually taken up. It is estimated by the Secretary of Agriculture that some 500 million acres of public lands remain unused, or practically useless, on account of the lack of water. Of this enormous area he believes that about one-fifth could be so reclaimed as to become arable land, while the remaining four-fifths, lying further from water, must still be utilised for grazing purposes, as at present, or await the growth of a system dependent upon artesian wells. As this great area represents something like one-fourth of the United States, exclusive of Alaska, and as much of it is naturally

rich and fertile land, lending itself well to improvement, the importance of the question in its larger bearings becomes at once apparent. Private settlers have made many efforts to cultivate portions of the arid regions without artificial water, but in almost all cases their efforts have ended in utter failure. The first successful attempt at artificial irrigation was made by the Mormon settlers of Utah, and their example was followed by large corporations and others, so that at present some 100,000,000 to 200,000,000 dollars, it is estimated, have been sunk in irrigation works. But it has been gradually recognised that since irrigation is necessary, the amount of 640 acres, formerly permitted to each individual, is much too large. The amount has now been cut down to 160 acres, and the new law ordains that receipts from the sale of land in the arid regions shall be set apart in a separate account in the Treasury for irrigation works. It is estimated that this sum will amount to about 3,000,000 dollars per annum. But these works are not to be a free gift to the settlers, for each one who avails himself of the water will be required to pay into the fund during the first ten years of his occupation such a sum as may be allocated as his proportion of the cost of the works. The scheme will thus be self-supporting, and it is hoped that within the next thirty years it will lead to the reclamation for arable purposes of 100,000 square miles of land.

POLAR.

Scottish National Antarctic Expedition.—At midday on Sunday, November 2, this expedition left Troon on its voyage to the Far South. The weather was exceedingly favourable, and a large party of interested spectators witnessed the departure. The *Scotia* was accompanied by the *Gleniffer* and the *Triton*, who escorted her to Kingstown, Dublin, which was reached on Monday. The passage was entirely favourable, the ship proving perfectly satisfactory. The Union Castle Line have presented coal to the expedition, and the boat stopped at Madeira for the purpose of taking it on board. Thence she will journey to the Falkland Islands, where, at Port Stanley, the scientific work will begin. Mr. Bruce expects to be in the ice by the beginning of 1903.

Before the departure of the expedition, a meeting of subscribers and others interested was held in the Merchants' House, Glasgow, on October 22, when it was explained by Mr. Bruce that the additional sum absolutely necessary to enable the expedition to remain away for one year was £1000, but it was strongly hoped that a sufficient sum would be forthcoming to permit of two years' work. At this meeting several additional subscriptions were intimated.

As briefly noticed in our last number, the members of the expedition were entertained by Sir John Murray to dinner before their departure. In replying to the toast wishing success to the expedition, which was proposed by Sir John Murray, Mr. Bruce emphasised anew the special nature of the work which they proposed to attempt. While the expeditions now at work are chiefly concerned with problems connected with land, the Scottish expedition's chief concern is to be with the ocean, the vessel having been specially fitted out with a view to oceanographical work, and more particularly to deep-sea dredging.

Peary's Results.—The accompanying sketch map, for which, together with the following note, we are indebted to the American Geographical Society, shows the region from Melville Bay to 84° 17′ N., the point Mr. Peary attained last spring in his remarkable sledge journey over the ice of the Arctic Ocean. This is the region in which his great explorations of the past twelve years have been made. As the map is designed specially to show the localities in which he has laboured during his last four years' visit to Greenland, his earlier work is not

indicated, excepting his sledge routes over the inland ice between the neighbourhood of Inglefield Gulf and Independence Bay; his earlier work, however, includes surveys of Inglefield Gulf and adjacent coasts, and of the northern and north-eastern coasts of Melville Bay, the locating of the Cape York meteorites,

hydrographical, glacial, meteorological and anthropological, investigations, and the largest collections, illustrating several branches of science, ever brought from the Arctic regions.

The map shows the locations of the various winter quarters occupied during the past four years; the position of the food caches, to which were carried by

sledge from Smith Sound large quantities of supplies for northern sledge expeditions; the sledge routes up the channels leading north from Smith Sound, and also around the northern end of the archipelago to the north of Greenland, and from Cape Hecla over the sea-ice to the most northern point yet attained in the American Arctic. For purposes of comparison, the highest latitudes reached by Markham and Lockwood and Brainard are indicated. The point reached by Peary is fifty-eight statute miles farther north than Lockwood's farthest.

The map also indicates the previously mapped coasts of which Mr. Peary has made new surveys, and also the new coasts that he has discovered and mapped. The positions of the coasts where these phases of work have been carried out are merely indicated, as the details of the surveys can be given only on maps of larger scale. A sketch map on a much larger scale, showing the region of intricate channels, penetrating deeply into the land between Cape Sabine and Cape Hawks, resurveyed by Peary, appears in the *Bulletin* of the American Geographical Society for 1899. That map also shows the deep inlet (Cannon Bay) south of Greely Fiord, whose extent was discovered by Peary on his sledge journeys of 1898-99.

The map material resulting from Mr. Peary's long journeys during the past four years will be of great value for the improvement of the atlas sheets of this portion of the Arctic regions.

GENERAL.

Foucault's Pendulum Experiment.—As is well known, fifty years ago Foucault succeeded in demonstrating the rotation of the earth by means of a pendulum experiment. On Wednesday, October 22, the centenary of the experiment was celebrated in the Pantheon at Paris by a repetition of it under the auspices of the Astronomical Society of Paris. A very large audience was present, and an address was delivered by M. Camille Flammarion, President of the Astronomical Society. An illustration showing the way in which the experiment was conducted will be found in the *Daily Graphic* of October 24.

Royal Geographical Society of Australasia, Queensland. - We are informed by this Society that the Thomson Foundation Gold Medal will be awarded to the author of the best original paper (provided it be of sufficient merit on each of the following subjects, the papers to be sent in by the date named: (1) The commercial development, expansion, and potentialities of Australia; or, briefly put, the commerce of Australia (July 1, 1903); (2) the pastoral industry of Australia, past, present, and probable future (July 1, 1904); (3) the geographical distribution of Australian minerals (July 1, 1905); (4) the agricultural industry of Australia (July 1, 1906).

The competition is open to members and non-members of the Society alike, whether residing in Australasia or elsewhere.

COMMERCIAL GEOGRAPHY.

The All-British Pacific Cable.—On October 1 the last link of this cable was completed at Fiji, and various congratulatory telegrams passed along the wires. As is pointed out by a *Times* correspondent, the completion of the cable brings the Australian Commonwealth some 10,000 miles nearer to the Dominion of Canada, and the world is now encircled by a wire which, except for Madeira and St. Vincent, passes through purely British territory. The new cable is more than 8000 miles long, and is built up of five sections, which are as follows:—Vancouver

to Fanning Island (3653 miles), thence to Fiji (2181 miles), to Norfolk Island (1019 miles), and then to Moreton Bay, Queensland (906 miles), and New Zealand (513 miles).

The Han River District.—The Journal of the Board of Trade contains extracts from a report on the Han river, a large tributary of the Yang-tse, which enters the latter close to Han-kow. The report has been received from our Minister in Peking. The country through which the Han flows from Siang-yang to Han-kow, a distance of 496 miles, is a rich grain-producing region, from which spring, summer, and autumn crops are obtained. Wheat and barley are mostly grown. A large quantity of surplus grain from this part of Hu-peh finds a market at Han-kow. The districts higher up than Siang-yang produce sesamum in large quantities. Rice is little grown, except near Han-kow and above An-lu. The people live chiefly on bread of different kinds. Besides grain the chief produce of the region is cotton, silk, kao-liang, from which wine is distilled, and beans. The junks bound down the river carry cargoes of grain, sesamum, and beans, which find a distributing centre at Han-kow. In fair weather these junks pass the *likin* stations on the river at the rate of 300 a day, which represents a large carrying trade. As far as An-lu there is no town of any considerable size, and such towns as exist are merely convenient depôts for storing grain, oil, etc., intended for the Han-kow market; and warehouses for produce are found in all these towns. There is also some cotton-spinning and cloth-making by hand looms. Siang-yang is an important centre; Lao-ho-kau, on the river higher up, is also a distributing centre of some size, and is the most important place on the river upwards from Han-kow so far. It takes cotton yarn and piece goods, foreign oil, sugar, etc., from Han-kow. It sends down sesamum, beans for bean-cake; British and German merchants in Han-kow do a large business by chartering junks to convey these staples down to Han-kow. The river is not suitable for steamers, and even with junks the risks are considerable owing to the uncertainty of navigation. The foreign trade on the Han is inconsiderable compared with the native trade, and it is likely to remain so as long as the river is the only trade-route. The ascending junk traffic is necessarily slow and tedious, though freight is moderate, the carriage of six tons to Siang-yang costing about £3, or about 10s. per ton. No towns of importance can possibly spring up on the river below Siang-yang, for the risk of freshets washing them away would be too great, and the river is liable to change its course in an extraordinarily short time, leaving towns which were once on its banks some miles away inland. This has occurred to An-lu. The houses at present on this part of the river are mere wooden mat sheds. The winding and uncertain course of the stream and the heavy freshets in summer prevent the stream from ever becoming a trade-route of great importance.

The Tigris and the Trade of Baghdad.—Major Newmarch, the Acting British Consul-General in Baghdad, in a report on his district for the past year, says that no description of the trade of the district would be complete without reference to the magnificent river Tigris, which is the chief means of communication between it and the outer world. The navigation, however, is growing increasingly difficult owing to the neglect of dredging, and the absence of supervision over the local Arabs, who cut channels and primitive canals in careless and unscientific ways. These cause the river to silt up, or to open out into broad shallows at awkward places, and thus lead to the restriction of steamer traffic, which helps largely to keep open the existing channels. If the proper preservation of the river received attention, the trade of the town and adjacent districts would be increased, and the

country would be developed to an extent that would amply repay the expenditure on the river. The export of wool declined last year owing to the great mortality amongst the Arab flocks on account of unfavourable weather leading to a scarcity of pasture. The market for mohair also was bad, as was that for galls from Mosul. Nearly all grain crops were short and of inferior quality owing to lack of rain and the low water in the Tigris, but the date harvest was excellent in quality as well as quantity, and the poorer classes fell back on dates more than ever, in consequence of the scarcity in grain. The main exports from the district are wool, which is by far the most important of all, gum, galls, skins and hides, carpets and mohair. The carpets are from Persia, Baghdad being merely a place of transit. The import trade in piece-goods was large last year, the demand from Persia and Kurdistan being considerable, and it was this trade that suffered chiefly by the deficiency in navigation, as bales of goods sometimes remained at Basra for months before they found a conveyance to Baghdad. The Euphrates and Tigris Company alone conveyed cloths to the value of over one million sterling to Baghdad last year. This trade is increasing owing to an extension of the system of giving long credits to small dealers by firms having the control of goods consigned for sale by manufacturers at home.—*Times.*

The Condition of the Philippines.—Mr. Sinclair, the British Acting Consul at Manila, in his report for the past year states that trade has not come up to the expectations formed of it. Imports were deficient owing to the unsettled state of the country and the scarcity of money. Exports, too, are less than in the previous year. As to the general condition of the islands, Mr. Sinclair says that the island of Luzon, north of Manila, is pacified, life and property being as safe as in Europe, save possibly close to the few head-hunting tribes left in the most inaccessible mountains ; but even these are being kept in check by the new police. This island contains the most important tobacco and rice districts in the archipelago, and several important British rice mills are situated along the Manila and Dagupan railway. The pacification of the district, and especially of the elevated province of Benguet, has led to the establishment in the latter of a sanatorium at Bagnio, a project mooted in Spanish times, but only now taking practical shape. A light railway is designed to connect it with Manila. In Southern Luzon a guerilla warfare was going on until early this year, and hemp and copra, the main productions of the region, suffered considerably by the closing of the lake and seaports. Mindoro is also pacified, although it was the scene of much military activity last year. The island, in spite of its nearness to Manila, is one of the least known of the group, owing to its rugged character and bad climate. Mr. Sinclair thinks it may become valuable for cattle breeding, though at present it is of no commercial importance. Samar, one of the most important hemp islands, gave great trouble to the military authorities last year. The island is rough and covered with thick jungle, penetrated by narrow trails, from which the American troops were sniped without much risk to the rebels. The neighbouring island of Leyte, also chiefly producing hemp, has been under civil rule for some time, but has been suffering from brigandage. Most of the towns are now open to trade. As to the important island of Panay, the centre of Philippine sugar production, it is now quiet, and so is the large island of Negros close by, save for one district. The Vice-Consul at Iloilo, the sugar port in Panay, says that the police are now fully established there, while all the chief towns have schools with American teachers. The main drawback is want of communication, the roads being bad, and in the rainy season almost impassable. There is some talk of a railway, which would give a great impetus to trade. Another very important island for trade is Cebu,

having the port of the same name. This, too, is now settled. Cebu is daily increasing in importance as a hemp port, being centrally situated as regards the main sources of supply. The harbour is good, and large vessels are able to lie close to the shore, and thus escape the heavy lightering expenses necessary in Manila.

As to Mindanao, the great southern island of the archipelago, and next to Luzon the largest of all, it is, except as to the coast, almost *terra incognita*. Its area is about 36,000 square miles, and much of it has never been explored. The population consists mainly of Mohammedan Malays, who were never subdued by the Spaniards, and still continue truculent. Hemp, rubber, gums, and other tropical products are exported, and when roads are constructed the forests will become a source of profit. A number of deep rivers run far into the island through rich land suitable for sugar and other plantations. Samboanga, the chief port, lies on the track of vessels from Australia to Manila. The western extremity of the island tapers off into the Sulu Archipelago, which is more in touch with Singapore than with Manila. The south-western boundary of the Philippines is the long, narrow island of Palman, or Paragna, which has little trade importance, except that from it and some of the neighbouring small islands large quantities of *bêche-de-mer* and material for birds'-nest soup are sent to Hong-kong for consumption by the Chinese. The trade of the southern islands is chiefly in the hands of Chinese. Mr. Sinclair summarises the situation as follows:—"The islands are pacified, but in an impoverished condition consequent on the events of the past five years. Not only has there been a great loss of life among the natives owing to war, but rinderpest and the "surra" disease have reduced the supply of draught animals to such an extent that all cultivation is seriously hampered. Rice, the staple food of the islands, has suffered most seriously, as not only has the actual amount planted been smaller than usual, but owing to drought the last year's crop was light." The local authorities favour the introduction of Chinese labour, but this is opposed from Washington. With one or two exceptions no steps have yet been taken to improve communications; the authorities are disposed to leave railways to private enterprise, but there is no inclination just yet to invest money in the Philippines, even the schemes for electric tramways in Manila, which are greatly needed, having failed on this account. British trade still maintains its predominant position in the archipelago. Last year, out of an import trade valued in all at $32\frac{3}{4}$ million dollars in gold or, roughly, $6\frac{1}{2}$ millions sterling), very nearly half went from British ports. The exports amounted to $20\frac{3}{4}$ million dollars, of which $13\frac{3}{4}$ millions went to British ports. Last year 913,349 bales of hemp were exported, six-sevenths of which were sent by British firms. A reduction in the export to British ports may be expected this year, owing to the abolition of the export duty on hemp sent to the United States. The total quantity exported will probably increase largely in the next few years, for, as tranquillity is re-established, larger areas will be planted with this valuable crop, which is not difficult to grow and is popular with the natives. The exports of sugar, copra, and tobacco have fallen, but the causes appear to be local and temporary.

NEW BOOKS.

EUROPE.

Mediæval Rome: From Hildebrand to Clement VIII., 1073-1600. By WILLIAM MILLER, M.A. "The Story of the Nations" Series. London: 1901.

Mr. Miller has succeeded in the short space at his disposal in giving a very readable account of that part of the history of Rome included in the period mentioned in the title. As that title sufficiently indicates, the story of Rome at that time is the history of the Papacy. The chief incidents are well told in a racy and somewhat satirical style. Sufficient reference is made to the traces left by the individuals mentioned, on the buildings and monuments of the city, to be a help to the sight-seer in Modern Rome. The illustrations are well chosen, but are somewhat unequal in execution.

Ireland, Industrial and Agricultural. Dublin: Browne and Nolan, 1902. Pp. 532. *Price 5s. net.*

After perusing this work (which originated in a Handbook to the Irish Pavilion at Glasgow Exhibition), we consider that its editor, Mr. W. P. Coyne, of the Department of Agriculture and Technical Instruction for Ireland, is perfectly justified in saying in his Preface that "it presents, perhaps, a fuller and fairer statement of the actual industrial position of the country than is contained in any other single volume." A glance at its Contents is sufficient to prove its wonderful range and completeness. After chapters on the geology minerals, soils, and climate of Ireland, its flora and zoology are treated of. Population, railways, and canals follow. Then come banks and co-operative credit associations. Agricultural education, and the Metropolitan, Belfast, and Crawford Schools of Art follow. Next come chapters on science teaching, the Royal Dublin Society, and the Royal and North-East, North-West, and Cork Agricultural Societies. Irish flax, agricultural co-operation, dairying, and bacon-curing occupy other chapters. The Congested Districts Board, and the Department of Agriculture and Technical Instruction, with the Dublin Museum of Science and Art, the National Library, and the Statistical Survey of Irish Agriculture follow. Then come the Irish horse-breeding industry, the ponies of Connemara, the Irish cattle industry, sheep-breeding in Ireland, sea-fisheries, and inland fisheries. Chapters on the Irish woollen, milling, leather, and tanning, Belfast linen, Derry shirtmaking, lace, poplin, art and cottage, shipbuilding, brewing, and distilling industries, conclude a volume of which its editor may well feel proud, whilst no fewer than 136 illustrations enable us to form a vivid idea of modern industrial and agricultural Ireland, which is very far from resembling the "distressful country" of a bygone generation.

East of Paris: Sketches in the Gâtinais, Bourbonnais, and Champagne. By Miss BETHAM-EDWARDS. London: Hurst and Blackett, Ltd. Pp. xi + 275. Six Illustrations (four coloured). *Price 7s. 6d.*

The title of this book calls for remark—the Gâtinais and Bourbonnais are not east but south of Paris, and Alsace and Lorraine, to which several chapters are devoted, are not French at all. Still we need not quarrel with the title, since the book itself is interesting, and this is specially the case with the account of Germanised France. It is striking to find that the passing of a generation seems to leave the heart of the Lorrainer as true to France as ever, and a change is not

likely to be effected by the exactions and irritating restrictions of the Kaiser. Miss Betham-Edwards avoids guide-book information, and tries to introduce her readers to the France which lies off the route of tourists, and to the honest peasantry who live there unchanged from generation to generation. In spite of some curiously careless writing, the book may be consulted with pleasure by those who wish to improve their acquaintance with the real France.

The Alps in 1864: *A Private Journal by A. W. Moore.* Edited by ALEX. B. W. KENNEDY. Edinburgh: David Douglas, 1902. Pp. xxxv + 444. Ten Maps and forty-two Illustrations. *Price* 36*s. net.*

For his own information the late Mr. A. W. Moore kept a minute record of his Alpine climbs, and from these *The Alps in* 1864 was printed by him and copies given to a few personal friends who shared his enthusiasm. The conception of a publication to the world at large never occurred to him; and though this has now been carried out in handsome style, it would be wrong to judge the book from any standpoint but that of the practical mountaineer. Indeed, even from his point of view, such sentences as the following might profitably have been omitted from this bulky volume:—"Sunday, 30th July.— I arrived in Paris at 5.10 A.M., and at 6.45 started again for Dieppe, which was reached at 10.15. The boat left at 11.5, and we had a most beautiful passage until we were within three-quarters of an hour of the English coast, when the sea got up, and most people were more or less unwell, before we landed at Newhaven at 5.10 P.M. The Brighton train started at 7.35, and deposited me at that place at 8.40 P.M." Nothing is to be learned from such passages, and they are apt to irritate.

The attraction of the book to sympathetic readers lies in its vividness. All the chance incidents of the day on the mountains, all details likely to aid later climbers, are recorded, and their value has been enhanced by the editor's notes and the illustrations, both of which are admirable. The book is in the main historical, for much has been done and written since its date,—it includes, by the way, some expeditions of later date than 1864,—and as a record of first ascents, as a mine for the lore of the pastime, and also as an introduction to a delightful personality, it will be fully appreciated by Alpinists.

Italian Life in Town and Country. By L. VILLARI. London: G. Newnes, Ltd., 1902. Pp. 261. *Price* 3*s.* 6*d. net.*

The happy relations which have always existed between Italy and Britain make us welcome this excellent addition to the well-written series of which it forms part. The author bids us beware against generalising regarding Italy and the Italians from residence in any one district, for the "differences of life, habits, character, and, to a certain extent, of language, which subsist between the inhabitants of one part of the Peninsula and those of another," are far greater than those between Englishmen and Scotsmen. We are surprised to hear that "the great majority of Italian women are as yet quite uneducated," and that the average Italian wife "speaks no language but her own, never opens a book, save occasionally some devotional work; she has no ideas beyond her children, the kitchen, and the linen cupboard." The Italian clergy, too, are in the mass quite uneducated. For the most part they belong to the lowest ranks of society, as the Roman Catholic Church does not confer favours on account of birth. The overwhelming majority are the sons of peasants or artisans. The average priest knows little beyond reading and writing, and he is often shaky at that. "Some of the lower class priests lead scandalous lives. It is not, therefore,

astonishing to read that the majority of the population are freethinkers, and that "the immense majority of the men never go to church at all." The author remarks that "the Italian Protestants are mostly persons of sincere religious convictions and of considerable culture. Many of their ministers are graduates of Edinburgh University." With regard to current Italian literature, we are informed that the greatest of Italian novelists at present is undoubtedly Fogazzaro, but D'Annunzio is the Italian Zola. "To read the works of Fogazzaro after a course of D'Annunzio is like coming out of a sewer and finding oneself on an Engadine plateau." De Amicis is "the most popular of living Italian authors," his *Cuore* having reached a circulation of 250,000 copies in Italy alone.

A Rambler's Notebook at the English Lakes. By the Rev. H. D. Rawnsley, Honorary Canon of Carlisle. Glasgow: James MacLehose and Sons, 1902.

Those of our readers who are acquainted with Canon Rawnsley's other works will know what to expect in his notebook of rambles among the English Lakes. In this his latest work they will find his usual exuberance and enthusiasm, his intimate personal acquaintance with the scenes and people he loves, his remarkable facility in word-painting, and his unquestionable skill in interesting his readers in a thrice-told tale. We are ready to pardon even the uncouth and unmusical dialect of Cumberland, when it is quoted by the Canon in some of his stories so quaint and characteristic of the scenes and people who are inseparably connected with Southey, Coleridge, and Wordsworth, the Lake poets of long ago. If any of our readers are meditating an expedition to Keswick and Derwentwater next spring, they could have no better *vade-mecum* than Canon Rawnsley's works, and especially this notebook.

ASIA.

The Struggle for Persia. By Donald Stuart. London: Methuen and Co., 1902. Pp. 268. *Price* 6*s.*

This book describes a journey from London to Tehrán through Odessa, Batúm, Tiflis, and Tabríz, a residence of some weeks in Tehrán with what was seen and heard there, and the return journey through Kasvín, Resht, and Baku. It is written after the manner of the smart, if superficial and not always quite accurate, newspaper correspondent. The outward journey from Tiflis onwards was doubtless rough and uncomfortable. The writer makes the most of that. He has little respect for the Persians, and much dread of the Russians. Indeed, the main object of the book is to impress the reading public with the effeteness of the administration of Persia, and her parlous position *vis-à-vis* of Russia. In that respect it may be distinctly useful.

An Autumn Tour in Western Persia. By E. R. Durand. Westminster: Archibald Constable and Co., Limited. 1902. *Price* 7*s.* 6*d.*

Of late we have had some excellent books on Persia, and it is awarding no small praise to Lady Durand when we say that in the interesting volume now before us she holds her own against such writers as Mrs. Bishop and Miss Sykes. As wife of the British Minister in Persia she had an exceptional opportunity of making a tour under the most favourable auspices, and her account of her experiences during the autumn of 1899 is always interesting and often exciting. It was no holiday task even for a man to undertake, and without in any way

bringing herself to the front, she says enough to let the reader see that she must have strong nerve, a cool head, and the ready presence of mind which count for so much in travelling through the less known and less civilised parts of the East. It is equally evident that she has great power of observation, a sincere sympathy with, and a generous appreciation of, the natives of Persia of all ranks and stations; even her dogs and horses were her personal friends. Lady Durand has also the trained eye of an artist for the beauties and wonders of nature, and an easy, simple, but at the same time graceful style in setting forth her impressions. The work is provided with a useful map, and is amply illustrated by excellent photographs, and we cordially recommend it to all our readers. In a future edition it might be as well to correct two errors which have somehow crept into the description of the staff of the mission at Ispahan, the one that Bishop Stuart had been a minister of the Presbyterian Church in Calcutta, and the other that his sister is associated with him in his present work. As a fact, Bishop Stuart has always belonged to the Episcopal Church, and the lady associated with him in Ispahan is his daughter.

L'Inde Française au XVIII^e Siècle. Ouvrage posthume de HENRI CASTONNET DES FOSSES. Publié par les soins de la Société de Géographie Commerciale, 8 Rue de Tournon, 8, Paris. *Prix*, 3 *fr.* 50.

Henri Castonnet des Fosses was a distinguished and energetic member of the Société de Géographie Commerciale of Paris who died in 1898, and it is a matter for real regret that the work now before us is the last from his pen which is likely to be published. The writer of the introduction to this volume describes him as "un travailleur, modeste et érudit, n'ayant jamais rien ambitionné que d'être utile dans cette sphère qu'il s'était choisie; . . . il fut instruit, honnête et bon." We hasten to add that this history of France in India in the eighteenth century amply justifies the writer's eulogium. The work may be fairly described as a history of the rise of the French power in India until it reached its zenith in the glorious days of Dupleix, and an attentive perusal of it leaves the impression that the author has carefully and honestly studied the best authorities on that, to France, most interesting period of Indian history, and has equally carefully and honestly set forth what he believes to be the true course of events. Malleson in his well-known monograph on Dupleix covers practically the same ground; and a comparison of the two works shows that the French writer is very accurate, and on the whole very just. The book cannot be pleasant reading to the French. In Caron, Martin, Dumas, and Dupleix they had a line of administrators and statesmen of whom any nation might well be proud, and who, if they had been supported from home as their genius and patriotism deserved, might have secured, at least for a time, the Empire of India for France. The administration of India from and by England claims and receives the admiration of the world, but we are ready to admit that our first teacher in the science of ruling Orientals was Dupleix, once an ensign of marines who rose to be a Marquis of France, Nawab of the Karnatic, Dictator of Southern India, statesman, diplomatist, and patriot of the first rank, whom his ungrateful and undiscerning fellow-countrymen persecuted to death of a broken heart, describing himself with only too much truth as being treated as "the vilest of mankind." All who are interested in the romantic and exciting history of the struggle between England and France for empire in India should read this book, which is very welcome to English readers because of its honest impartiality and absence of rancour and prejudice, qualities, we need hardly remind our readers, too rarely found in histories written by French authors.

AFRICA.

Aus den Staaten der Barbaresken. Von Dr. E. Dagobert Schoenfeld. With 16 Photographs and 2 Autotypes. Berlin: D. Reimer (E. Vohsen), 1902.

The author, when at Tunis, finding no mention of Tripoli in the guide-book, resolved to explore the readily accessible parts of the State of Tripoli, and gives the results of his impressions in the first half of the volume. He writes from the philo-Turkish point of view, and as an apologist for domestic slavery. A visit to the Turkish infantry barracks at Tripoli, which are large and handsome buildings, left a very favourable impression on his mind. Everything was clean, tidy, and comfortable. Each man has a locked box to keep his possessions in. Two hot meals are provided daily, and each soldier receives 3s. 6d. a month of pay. In the cavalry and artillery barracks it was the same—saddles, stirrup-irons, guns, were all clean and well looked after. In the military hospital, a new and imposing structure, the sick lay in good, clean beds, and at the head of each bed was a ticket, showing from what ailment the patient suffered. The author was specially interested in a visit to the cadet school, where he found 270 students. Amongst other things they are taught Turkish, Arabic, French, and the elements of English. The cadets, who are drawn from all classes and sections of the native population, are not obliged to enter the army when they have passed their final examinations. Those who wish to do so are sent to Constantinople to complete their instruction. In 1901 an industrial school for instructing orphan children in various trades and handicrafts was opened under the auspices of the Turkish Governor, and promises well.

When at Tripoli, where he ultimately passed three winters, the author made some short excursions in the neighbourhood, and among others visited Lebda, the ancient Leptis Major, to examine the ruins, which do not often attract the tourist. He strongly recommends Tripoli as a winter station for consumptives in preference to Egypt or Biskra, partly on account of its possessing a rather better climate, and partly on account of the far greater economy of living. But first it would be necessary to build a Sanatorium, as the present hotel accommodation is quite inadequate. The Turks, it seems, are not much disturbed at the idea of the invasion and annexation of the State of Tripoli by the Italians. They believe they could hold their own, and in the author's opinion the undertaking would be very difficult, and even if successful would bring small profit to Italy, owing to the poverty and unfruitfulness of the territory.

The second half of the book relates to Tunis, and, with the exception of the baths at Corbos, deals only with places described in the guide-book and in many books of travel.

In Pursuit of the "Mad" Mullah: Service and Sport in the Somali Protectorate. By Captain Malcolm M'Neill, D.S.O., with a chapter by Lieutenant A. C. H. Dixon. London: C. Arthur Pearson, Limited, 1902. Pp. 313. Illustrated. *Price* 6*s.*

Captain M'Neill's book appears opportunely. He gives the narrative of last year's expedition against the Mad Mullah (in which he commanded the second column), an undertaking that was in many ways a remarkable one. Colonel Swayne hastily gathered a levy at the coast, drilled them, sent them up country, though scarcely one man till then had fired a rifle, and some six or seven weeks later fought an entirely successful action against long odds. This success was repeated, and the Mullah was driven from British territory. But a peremptory order for the return of the force came from home, and had to be obeyed, just when,

in Captain M'Neill's opinion, a stay of ten days or a fortnight would have done much for the settlement of the country. In spite of this favourable experience the author's opinion of the Somali as a soldier is that his bravery has been overrated, and that his excitability renders him nearly useless in a tight place. He is, however, a good marcher and a good mounted scout.

The sporting portion of the book is a considerable one, and includes a warm plea for the preservation of the lion. Under the shooting regulations now in force in the Protectorate no limit is placed on the number of lions killed, though the shooting of elephants, rhinoceroses, cheetahs, etc., is restricted. Captain M'Neill's view is that the experience of the Uganda Railway constructors is not that of Somaliland, and that few cattle are taken; while, on the other hand, the reputation of the country for this class of sport has been of benefit to it, and has enhanced British influence. He therefore advises the imposition of some regulations.

The book has been entirely written when under canvas, but as it shows no sign of having been produced at disadvantage, we venture to point out that a map would have been of assistance to the reader. The illustrations are good. A curious one shows an officer teaching bugle-calls by means of a banjo.

Manual of Egyptian Archæology and Guide to the Study of Antiquities in Egypt, for the use of Students and Travellers. By G. Masters, D.C.L., Oxon. Translated by Amelia B. Edwards. Fifth edition, revised and enlarged by the Author, with supplementary chapter by the English Editor. With 336 Illustrations. London: H. Grevel and Co., 1902.

A volume of this kind requires but a brief notice. Compared with the second edition of 1889 the page is rather smaller, the paper and binding thinner, though it contains about thirty additional pages. It is therefore considerably lighter in weight and more portable, a great convenience in a travelling companion. The supplementary chapter by Miss Edwards gives a brief sketch of the predynastic period and of the great additions to our knowledge made within the last decade by British and French archæologists. The illustrations are now increased from 299 to 336. Yet in a good many cases the woodcuts of the older edition are clearer and better than in the present edition, where the shadows are often too black and opaque. And among the new illustrations fig. 328 (a sculptured plaque of King Narmer) cannot be regarded as successful when compared with that given by Mr. Budge in the first volume of his *History of Egypt*.

Eastern Uganda: An Ethnological Survey. By C. W. Hobley, Sub-Commissioner of Uganda Protectorate. London: Anthropological Institute, 1902.

In this pamphlet Mr. Hobley gives some very interesting notes on the tribes inhabiting the Eastern portion of the Uganda Protectorate, together with some vocabularies of their languages. The tribes are divided into four groups:—(1) Bantu Kavironda; (2) Nilotic Kavirondo or Ja-Luo; (3) Nandi group; (4) Masai group. With regard to the first named, the author believes that there is reason to believe that these representatives of the Bantu race entered from the direction of the Nyamwezi country, and that there must formerly have been extensive northward migrations on the part of the Bantu. It is probable that these migrations were checked by the later invasion of the Nilotic Ja-Luo race, which, although occupying less fertile country, seem to be a stronger race than the Bantu. The Nandi group, like the Masai, must in all probability be regarded as the result of an intermixture of the negroes of the Nile valley and a representative of the Hamitic race. Probably the Nilotic negro stock predominates in the first-named,

and the Hamitic stock in the Masai. The Nandi certainly came from the North. The Masai only occur in scattering settlements among the other tribes. In addition there is a tribe of hunters known as Eldorobo or Wandorobo, which wander about in the forests of the Mau plateau. Though provisionally placing these with the Masai, the author is inclined to believe that they may be the surviving representatives of the aboriginal race which inhabited the country before the irruption of the Bantu, Nilotic, and other tribes. The author considers that there is no ground for the suggestion that they are allied to the Negrillo or pygmy races. They have no fixed homes, and have practically adopted the language of the Nandi, a patois of which they speak. But the older men are stated to speak also another language quite distinct from that of the Nandi, thus suggesting that the tribe is in process of losing its original language.

The author gives a number of details as to the habits and mode of life of these tribes, and though he speaks modestly of his observations, they contain much of great interest. We can only echo his hope that every effort will be made to collect full anthropological data in regard to these peoples before their characteristic features are obliterated by the advent of European civilisation.

AMERICA.

Aconcagua and Tierra del Fuego. By Sir Martin Conway, President of the Alpine Club, Slade Professor of Fine Art in the University of Cambridge. London, Paris, New York, and Melbourne: Cassell and Co., Limited, 1902. *Price* 12*s.* 6*d.*

A new book on mountain-climbing from the experienced and skilful pen of Sir Martin Conway is always welcome. To his previous works on the Karakoram Himalayas, the Alps, and the Bolivian Andes he now adds one on Aconcagua, the highest peak of the Chilian Andes, 23,100 feet above sea-level, which he and his trusty Swiss guide Maquiquaz ascended in December 1898. Readers of Sir Martin's delightful book on the Bolivian Andes will recollect that he was unfortunate in that expedition, as bad weather prevented him ascending Ankohuma, the highest peak of the range. He had better luck with the Chilian Andes, for he accomplished the ascent of Aconcagua on the very last day of the season on which it was practicable. Pellissier, the other Swiss guide, who had been Sir Martin's faithful companion in former explorations, broke down when not far from the summit and had to beat a retreat. Having accomplished the ascent of Aconcagua, Sir Martin went on to the Tierra del Fuego and Patagonia, of which he gives a most interesting description. He attempted the ascent of Mount Sarmiento, but when near the summit he and Maquiquaz were driven back by a storm.

It is with a very sincere regret that all lovers of mountaineering and exploration will read the first sentence in the preface to this book. "This book is the record of the last of my own mountain-explorations that I shall write." Apparently Sir Martin has decided to turn his great abilities and restless energy to some other pursuit, for he continues: "The world is wide, and contains other things besides mountains delightful to study. . . . For all of us there are many kinds of joy as yet unexperienced, many activities untried, many fields of knowledge unexplored. We must not spend too large a fraction of life over one, or the rest will escape us. It is life, after all, that is the greatest field of exploration. We need not travel to remote places to find it. There, no doubt, I shall find again some of the friends that I and the mountains have shared. I will not bid them *adieu*, but *au revoir*!" This wish will be cordially reciprocated on all sides.

AUSTRALASIA.

The Wealth and Progress of New South Wales, 1900-1. By T. A. Coghlan. 13th issue. Sydney: 1902.

The author has as usual spared no pains in collecting and tabulating in readable form a large mass of statistical information about this old colony. A perusal of this very solid volume of 1043 pages leaves rather an unpleasant impression of the kind of "progress" that New South Wales has been making for some time, and the year 1901 is unhappily behind some of its predecessors in a good many directions. If we turn, for example, to the vital statistics, we find that although the population increased during the last decade of the century from 1,121,860 to 1,364,587, a steady decrease in the birth-rate has been in progress since 1860. Forty years ago this figure was 41·83 per 1000, but in 1900-1 it had fallen to 27·51—a point lower than that of every European country except France and Sweden. At the same time, there has been a steady increase in the percentage of illegitimate births, and in this respect New South Wales enjoys the unenviable distinction of holding the first place among the States of the Australian Commonwealth, the whole percentage for the State being 6·88, and for Sydney, its capital, 10·08. The annual increase of the population from the excess of births over deaths was 2·30 per cent. from 1880 to 1884, and only 1·64 per cent. in 1900, so that if the colony goes on "progressing" in this direction, a few more decades will see it sink to a condition such as obtains in the French Republic at present. The number of unhappy marriages in New South Wales seems to be prodigious if the records of the divorce court are to be taken as a criterion. In Canada, which of all countries seems the happiest in this respect, the number of divorces per 10,000 marriages is only 4, while the United Kingdom comes next with 11, but New South Wales has no less than 261, and is only surpassed by Switzerland with 432, and the United States, where the nuptial knot is most easily untied of all, with 612. These figures and sundry others which are given in the chapter on vital statistics point to a very serious state of public morals in the oldest of the Australian Colonies, and Mr. Coghlan does well to draw attention to the increasing gravity of the social situation there. Another unsatisfactory feature of the State is the steady increase in the public debt, which up to 1901 exceeded £67,000,000, or £49, 6s. per inhabitant, against something like £16 per inhabitant in the United Kingdom. Of course, against this must be placed the assets of the State in the shape of railways and other public works which have been constructed out of money borrowed mostly from outside. These works, after paying all expenses, are stated to yield a revenue of nearly £2,000,000, or a little more than half a million less than the two and a half millions required to pay interest on the debt, and the balance is made up of the revenue from the public lands, which is calculated to produce nearly half a million of a surplus every year, which fact the author says ought alone to be evidence of the ability of the State to meet its engagements with the public creditors. The net return on the 39 millions spent on railways in 1901 yielded about 1½ millions, or 3·94 per cent., being only 0·13 per cent. above the actual interest payable, so that the margin is not a large one. A considerable number of the railways are unproductive, and over 14½ millions have been spent on lines which during the last four years have been run at a loss of over £300,000 a year—a loss which increased somewhat in 1901 over the previous year. In other respects the colony seems to be holding its own, but from these bald statements of a few actual facts it is clear that New South Wales must mend its ways if it wishes to gain the respect of the other parts of the Empire and enjoy solid prosperity in future.

BOOKS RECEIVED.

We have received the following new books, which will be reviewed in due course :—

The Struggle for Persia. By Donald Stuart. London : Methuen and Co., 1902. Crown 8vo. Pp. x + 268. *Price 6s.*

Physical Geography. By Grove Karl Gilbert and Albert Perry Brigham. London : Hirschfeld Brothers, 1902. Royal 8vo. Pp. xvi + 380. *Price 5s.*

Ireland, Industrial and Agricultural. Dublin, Cork, Belfast : Browne and Nolan, 1902. Imp. 8vo. Pp. 532. *Price 5s.*

The Eldorado of the Ancients. By Carl Peters. London : C. Arthur Pearson, 1902. Demy 8vo. Pp. x + 457. *Price 21s.*

A Teacher's Manual of Geography. By Charles McMurry. New York : The Macmillan Co., 1902. 8vo. Pp. 107. *Price 2s. 6d.*

La Question Israélite en Roumanie. By Jean Lahovary. Bucharest : E. S. Cerbu, 1902. Pp. 77. *Price 1 franc.*

British Nigeria. By Lieut.-Col. A. F. Mockler-Ferryman. London : Cassell and Co., 1902. Extra crown 8vo. Pp. viii + 351. *Price 12s. 6d.*

Die Alpen im Eiszeitalter. Von Dr. Albrecht Penck u. Dr. Eduard Brückner. Parts III. and IV. Leipzig : Tauchnitz, 1902. *5 marks per part.*

The Great Mountains and Forests of South America. By Paul Fountain. London : Longmans, Green and Co., 1902. 8vo. Pp. 306. *Price 10s. 6d.*

Chronologia delle Scoperte e delle Esplorazioni Geografiche. Dall' anno 1492 a tutto il secolo xix. Per Luigi Hughes. Milano : Ulrico Hoepli. Dated 1903. Pp. viii + 487. *Price 4·50 lire.*

L'Eritrea. Dalle sue origini a tutto l'anno 1901. Per B. Melli. Milano : Ulrico Hoepli, 1902. Pp. xii + 163.

Rabeh und das Tschadseegebiet. Von Dr. Max Freiherrn von Oppenheim. Berlin : Dietrich Reimer, 1902. Pp. 199.

Climbing on the Himalaya and other Mountain Ranges. By J. Norman Collie. Edinburgh : David Douglas, 1902. Demy 8vo. Pp. vii + 315.

The Coal-fields of Scotland. By Robert W. Dron. London : Blackie and Son, 1902. Demy 8vo. Pp. vi + 368. *Price 15s.*

In Pursuit of the Mad Mullah. By Captain Malcolm MacNeill. London : C. Arthur Pearson, 1902. Crown 8vo. Pp. xi + 313. *Price 6s.*

Manual of Egyptian Archæology. By G. Maspero. Translated by Amelia B. Edwards. Fifth edition, revised and enlarged. London : H. Grevel and Co., 1902. Crown 8vo. Pp. xxviii + 391. *Price 6s.*

Also the following reports, etc. :—

Twentieth Annual Report of the Fishery Board for Scotland. Part III. *Scientific Investigations.* Glasgow, 1902.

Journal of the Calvert Scientific Exploring Expedition, 1896-97. Perth (Australia), 1902.

Census of India, 1901. Vol. ix. Bombay, 3 parts. Bombay : Government Central Press, 1902.

Papers and Reports relating to Minerals and Mining. New Zealand. Wellington : John Mackay, Government Printer, 1902.

Annual Report of British New Guinea from 1st July 1900 to 30th June 1901. Brisbane : Government Printing Office, 1902.

Report on the Administration of the Meteorological Department of the Government of India in 1901-2. Meteorological Office, Calcutta, India.

Statistical Register. Colony of the Cape of Good Hope, 1901. Cape Town: W. A. Richards and Sons, Government Printers, 1902.

Catalogue of Canadian Plants. Part vi. Lichens and Hepaticæ. By John Macoun. Ottawa: Government Printing Office, 1902.

And the following numbers of the *Bulletin of the United States Geological Survey*:—

No. 177. Catalogue (of) and Index of the Publications of the U.S. Geological Survey 1880-1901. By P. C. Warman. 1901.

No. 178. The El Paso Tin Deposits. By W. H. Weed. 1901.

No. 180. The Occurrence and Distribution of Corundum in the United States. By J. H. Pratt. 1901.

No. 181. Results of Primary Triangulation and Primary Traverse, Fiscal Year 1900-1. By H. M. Wilson and others. 1901.

No. 182. A Report on the Economic Geology of the Silverton Quadrangle, Colorado. By F. L. Ransome. 1901.

No. 183. A Gazetteer of Porto Rico. By Henry Gannett. 1901.

No. 184. Oil and Gas Fields of the Western Interior and Northern Texas Coal Measures, and of the Upper Cretaceous and Tertiary of the Western Gulf Coast. By G. I. Adams. 1901.

No. 185. Results of the Spirit Levelling, Fiscal Year 1900-1. By H. M. Wilson and others. 1901.

No. 186. On Pyrite and Marcasite. By H. N. Stokes. 1901.

No. 187. Geographic Dictionary of Alaska. By M. Baker. 1901.

No. 188. Bibliography of North American Geology, Palæontology, Petrology, and Mineralogy for 1732-1900 (inclusive). By F. B. Weeks. 1902.

No. 189. Index to North American Geology, Palæontology, Petrology, and Mineralogy for 1732-1900. By F. B. Weeks. 1902.

No. 190. Bibliography and Catalogue of the Fossil Vertebrata of North America. By C. P. Hay. 1902.

No. 191. A Gazetteer of Texas. By Henry Gannett. 1902.

No. 192. A Gazetteer of Cuba. By Henry Gannett. 1902.

No. 193. Geological Relations and Distribution of Platinum and Associated Metals. By J. F. Kemp. 1902.

No. 194. North West Boundary of Texas. By M. Baker. 1902.

Also the *Mineral Resources of the United States*, Year 1900. Geological Survey. And the *Memoirs of the American Museum of Natural History*:—

Vol. vi. (Publications of the Hyde South Western Expedition.) The Night Chant, a Navaho Ceremony. By W. Matthews. May 1902.

Vol. ii. Symbolism of the Huichol Indians. By Carl Lumholtz. May 1900.

The following have been presented to the Library of the Society:—

L'Irrigation, dans la Peninsule Iberique et dans l'Afrique du Nord. Par Prof. Jean Brunhes. Paris: C. Naud. 1902. Pp. 441–879. Presented by Mr. Richardson.

An Itinerary on the Route from Sikkim to Lhasa. By Graham Sandberg, M.A. Calcutta: Printed for the author at the Baptist Mission. 1902. Presented by the author.

Publishers forwarding books for review will greatly oblige by marking the price in clear figures, especially in the case of foreign books.

ROYAL SCOTTISH GEOGRAPHICAL SOCIETY.

REPORT OF COUNCIL.

Eighteenth Session, 1901-1902.

The Council has the honour to submit the following Report:—

Membership.

The changes which occurred during the Session in the number of members were as follows:—

Number on 1st November 1901,		1359
New members added,		46
		1405
Deduct by Death,	24	
,, Resignation	61	
Struck off the roll (subscriptions in arrear),	4	
		89
Number remaining on 31st October 1902,		1316

Of this number, 752 are on the Edinburgh list, 242 are on the Glasgow list, 97 and 79 are on the Dundee and Aberdeen lists respectively. In addition to those on the lists named, 47 members reside abroad, and 99 reside in England. Of the total number of 1316 members, 269 are life members.

The Council deplore the loss of Mr. James A. Wenley, a Trustee, and of Mr. Robert Irvine and Mr. Lewis F. W. Garriock, Members of Council, who died during the Session. Mr. J. M. W. Gilchrist, who had served the Society as chief clerk since 1885, retired on account of ill health. The Council recorded its appreciation of his services.

Finance.

The Council begs to submit the Annual Financial Statement.

ABSTRACT OF THE ACCOUNTS OF THE ROYAL SCOTTISH GEOGRAPHICAL SOCIETY

From 31st October 1901 to 31st October 1902.

FUNDS AT CLOSE OF LAST ACCOUNT:—			
£1000 Glasgow and South-Western Railway Company 4 per cent. Funded Debt, at cost, as at 29th May 1885,		£1102	19 9
£533, 6s. 8d. North British Railway Company 3 per cent. Consolidated Lien Stock, at cost, 30th December 1890,		496	2 0
£300 New Zealand Government 3½ per cent. Inscribed Stock, at cost, as at 30th May 1894,		301	9 10
£200 Great Central Railway Company 4½ per cent. Debenture Stock, at cost, as at 31st December 1898,		312	2 9
		£2212	14 4
BALANCE DUE BY BANK OF SCOTLAND:—			
On Account Current (Edinburgh),	£158 4 7		
Less applicable to Antarctic Exploration Fund,	62 14 0		
		95	10 7
BALANCE due by Secretary,	£4 18 9		
BALANCE due by Aberdeen Treasurer, £4, 15s. 11d., and Glasgow Treasurer, £3, 3s.,	7 18 11		
		12	17 8
		£2321	2 7
SUBSCRIPTIONS from Ordinary Members,	£1188 10 0		
Do. do. Life Members,	124 19 0		
FEES received for Society's Diploma,	4 5 0		
LECTURE TICKETS sold,	33 9 0		
MAGAZINES sold,	70 10 11		
DIVIDENDS and INTEREST,	74 9 2		
SPECIAL Donation for Library,	5 5 0		
		1501	8 1
		£3822	10 8

MAGAZINE—Printing, Paper, Lithographing, etc., from Nos. 8 to 12 of Vol. XVII., and Nos. 1 to 9 of Vol. XVIII., and for Postages, Delivery, etc., less received for advertising in Magazine,		£570	11 9
GENERAL PRINTING,		32	6 0
BOOKS and other Furnishings for Library,		14	5 7
RENTS OF HALLS, and other expenses of Lectures,		214	10 7
RENT OF GLASGOW HALL, and attendance,		60	0 0
RENT OF COUNCIL ROOM, Taxes, Gas, Repairs, Insurance, etc.,		124	19 8
ADVERTISING,		31	13 0
SALARIES:—			
Secretary,	£200 0 0		
Editor and Clerks,	223 15 6		
		423	15 6
MISCELLANEOUS, including Stationery, General Expenses, Cleaning, Postages, and General Expenses at Glasgow Branch,		60	8 7
SUM transferred to Livingstone Medal Fund,		0	11 6
DIPLOMA,		0	6 0
		£1533	8 2

The above Accounts contain the expenses at Glasgow for two years.

FUNDS AT CLOSE OF THIS ACCOUNT:—			
£1000 Glasgow and South-Western Railway Company 4 per cent. Funded Debt, at cost, as at 29th May 1885,	£1102 19 9		
£533, 6s. 8d. North British Railway Company 3 per cent. Consolidated Lien Stock, at cost, as at 30th December 1890,	496 2 0		
£300 New Zealand Government 3½ per cent. Inscribed Stock, at cost, as at 30th May 1894,	301 9 10		
£200 Great Central Railway 4½ per cent. Debenture Stock, at cost, as at 31st December 1898,	312 2 9		
	£2212 14 4		
BALANCE due by Bank of Scotland, on account current,	76 0 9		
BALANCE due by Secretary,	0 7 5		
		2289	2 6
		£3822	10 8

Edinburgh, 19th November 1902.—I have examined the Accounts of the Royal Scottish Geographical Society for the year ending 31st October 1902, of which the above is an Abstract, and compared them with the Vouchers and Instructions thereof, and find the same correct and sufficiently vouched. HUGH BLAIR, C.A.

ANTARCTIC EXPLORATION FUND

Funds at Close of Last Account—		
Sum in Bank of Scotland, Edinburgh, on Deposit Receipt	£100 0 0	
Sum in Bank of Scotland, Edinburgh, on Account Current	67 14 0	
	£167 14 0	
Subscriptions received,	122 19 0	
	£290 13 9	

Transferred to General Treasurer of the Fund at Glasgow,	£290 13 9
	£290 13 9

Edinburgh, 19th November 1962.—Examined and found correct.—HUGH BLAIR, C.A.

LIVINGSTONE MEDAL FUND

Sum received from Mr. Bruce for Endowment of Livingstone Medal,		£1000 0 0
Income received—		
1. Dividend on £779 North British Railway Company 4 per cent. Consolidated Preference Stock No. 1—		
For half-year to 31st January 1962, £15 3s. less tax,	£11 0 1	
For half-year to 31st July 1962, £15 3s. less tax,	11 9 3	
	£22 9 4	
2. Sum transferred from the General Funds of the Society,	6 11 6	
		29 0 10
		£1029 0 10

Paid purchase price of £779 North British Railway Company 4 per cent. Preference Stock No. 1,			£999 11 6
Sums lodged on Deposit Receipt with Bank of Scotland, Greenside Branch—			
1962 April 7 Of this date,	£11 2 7		
" Oct. 16 Do.,	11 9 3		
		22 17 19	
Paid Messrs. Bruce & Son for engraving on medal,			6 11 6
Funds at close of this account—			
£779 North British Railway Company 4 per cent. Preference Stock No. 1, at cost price,		£999 11 6	
Sums on Deposit Receipt with Bank of Scotland, Greenside Branch, lodged (1st April 1962,	£11 2 7		
Do. Do. lodged 16th Oct. 1962,	11 9 3		
		22 17 19	
		£1022 9 1	
Original Capital,	£1000 0 0		
Income,	22 9 4		
		1022 9 4	
			£1029 0 10

Edinburgh, 19th November 1962.—Examined and found correct.—HUGH BLAIR, C.A.

Alteration of Laws.

The following alterations were made in the Society's Laws :—

Law XXVI. For the words "a single payment or donation of not less than ten guineas shall constitute the subscriber a Life Member," *substitute the following, viz.* :—

'A member may compound for Life Membership by payment as follows, viz. :—

'1. When under 10 years' standing, . . .	£20.
'2. When over 10 and under 20 years' standing, . .	£15.
'3. When over 20 and under 30 years' standing, . .	£10.
'4. When over 30 years' standing, ...	£5.'

The Library Regulations were revised by the Council.

Livingstone Gold Medal.

The first Livingstone Gold Medal was awarded by the Council to Sir Harry H. Johnston, G.C.M.G., K.C.B., for his distinguished services as an explorer and administrator in Africa.

Society's Medals and Diplomas of Fellowship.

The Honorary Diploma of Fellowship was conferred on the Hon. A. C. Gregory, C.M.G. The Ordinary Diploma of Fellowship was conferred on Mr. John Stewart and on Mr. Alexander Macdonald.

Meetings.

The Annual Business Meeting was held on the 21st November.

The Society's Anniversary Meeting was addressed by Sir Harry H. Johnston, G.C.M.G., K.C.B. Twenty-six ordinary Meetings were held, twelve of them in Edinburgh, five in Glasgow, five in Dundee, and four in Aberdeen. These meetings were addressed by the Rev. Adrian Hofmeyer, the Rev. George Adam Smith, D.D., Professor Norman Collie, Mrs. Archibald Little, Mr. Thomas R. Smith, The Earl of Ronaldshay, Commander B. Whitehouse, R.N., Professor Robert K. Douglas, Professor Edmund J. Garwood, Professor W. M. Ramsay, the Rev. Thomas Lewis, Major H. H. Austin, C.M.G., D.S.O., and the Rev. W. Campbell.

Delegations.

Dr. James Burgess, C.I.E., LL.D., acted as the Society's delegate to the Congress of Orientalists which assembled at Hamburg in September. Dr. H. R. Mill represented the Society at the Conference of Delegates of British Geographical Societies held in London in May.

The Society's Magazine.

The Scottish Geographical Magazine has, as usual, been published monthly throughout the past Session. Miss M. I. Newbigin, D.Sc., was appointed Editor in succession to Mr. Sandeman, who resigned.

The Council is glad to acknowledge its obligation to the contributors of articles, and to the following gentlemen who have rendered valuable assistance to the Editors :—The Hon. J. Abercromby, J. G. Bartholomew, W. S. Bruce, Dr. J. Burgess, H. M. Cadell, Rev. Hugh Callan, C. G. Cash, J. Chumley, W. Eagle Clarke, H. B. Finlay, Dr. A. J. Herbertson, Dr. Cargill G. Knott, Rev. Robert

Mackenzie, J. R. Reid, Ralph Richardson, Dr. J. Young Simpson, Dr. George Smith, W. A. Taylor, Coutts Trotter, and W. B. Wilson.

Library and Map Department.

During the past Session 272 books, 49 pamphlets, 77 reports, 7 atlases, 202 map-sheets, and 119 charts have been added to the library. The number of volumes borrowed by members was 1,52; and the library was, as usual, much consulted by non-members in search of Geographical information. The expenses of the library amounted to £14, 5s. 7d.

The Council desires to record its thanks to foreign and Colonial Governments for the official publications they have presented to the library; and also to the undermentioned private donors of books and maps, viz.:—Dr. M. A. Stein, Rev. Wm. Marwick, A. A. G. Dobson, Dr. Francis P. Moreno, R. Hay Anderson, Dr. Gunnar Anderson, H. N. Dickson, B.Sc., W. B. Blaikie, Captain Charles Lemaire, O. Pettersson, W. Lindsay Alexander, E. Delmar Morgan, Alfonso Lomonago, Edward Whymper, Ralph Richardson, Professor Heilprin, A. J. Wauters, R. C. Mossman, and the Royal Geographical Society, London.

Scottish Antarctic Exploration Fund.

The following additional subscriptions have been received, viz.:—

Anonymous,	£50	0	0
Dr. H. R. Mill,	3	3	0
Surgeon Major Black,	1	1	0

The entire sum in the Secretary's hands has been paid over to the Honorary Treasurer to the Expedition.

The Society's Branches.

The Council has again the pleasure to acknowledge the services rendered by the honorary officials of the Society's Branches at Glasgow, Dundee and Aberdeen.

PROCEEDINGS OF THE ROYAL SCOTTISH GEOGRAPHICAL SOCIETY.

Meeting of Council.

A Meeting of Council was held on the 20th November, when Sir Harry H. Johnston, G.C.M.G., K.C.B., first Livingstone Gold Medallist, was elected an Honorary Member; Mr. John Middleton, *West Africa*, and Major Sykes, *Persia*, were elected Honorary Corresponding Members; and the under-mentioned New Members were admitted:—

Mrs. R. M. Henderson.
Mrs. W. E. Utterson-Kelso.
Mrs. J. R. Dunlop.
Mrs. R. Campbell.
Mrs. John Rae.
Miss P. T. Macvicar.
Mrs. Helen Gloag.
Mrs. Wilkie.
William Wilson Adam.
Alex. Hurll.
James M'Kelvie.
Rev. F. R. Ritchie.
H. W. Smith.
P. B. Moodie.
James Mitchell.
John J. Purves.

Miss Grace Kindersley.
Mrs. J. B. B. Watson.
Miss Campbell.
Miss Thomson.
Mrs. J. R. Japp.
Miss H. M. Sturrock.
Miss Ayles.
Bernard F. Hall, M.A., F.R.G.S.
Robert Clark.
J. D. Monro.
Hume Purdie, L.D.S.
William Middleton.
T. W. Jones, W.S.
F. W. Flint.
Adam Brown.
G. W. M'Ewen Brymner.
Matthew Morrison.
Alfred G. Bell.
John Dewar.
James S. Hood.
Thomas Johnston.
H. R. M'Kean.
P. T. H. Grierson, F.R.G.S.
C. J. F. Paisley.
Angus Murray.
Sir James Low.
Lieut.-Col. H. L. Hallewell
Chas. Ritchie, S.S.C.
John Henderson.

The Annual Business Meeting

was held on the same day in the Society's Hall, Sir James Russell occupying the chair. The Secretary read the Annual Report of the Council, in moving the adoption of which the Chairman referred to the loss the Society had sustained by the death of Mr. James A. Wenley, Trustee, and of Mr. Robert Irvine and L. F. A. Garriock, Members of Council; he also commented on the various items of the Report. He drew attention to the excellence of the Society's *Magazine* as brought out by the Editor, and to the attractive programme of lectures which had been issued. He urged on the meeting that it was the duty of members of the Society to bring the advantages offered by it to the notice of friends and acquaintances who are interested in geographical work, with a view to adding to the roll of members and thereby increasing the capacity for usefulness of the Society. The adoption of the report was seconded by Mr. Weinberg and carried unanimously.

Sir John Murray, K.C.B., was then re-elected President, and the Vice-Presidents were also re-elected. The following Members of Council who retired by rotation were re-elected, viz.:—W. A. Taylor, M.A., H. M. Cadell, B.Sc., J. B. Sutherland, Wm. C. Dunbar, C.B., F. Grant Ogilvie, M.A., B.Sc., Dr. Cargill G. Knott, D.Sc., William C. Smith, K.C., M.A., Coutts Trotter, H. B. Finlay, the Hon. J. Abercromby, W. F. G. Anderson, *Glasgow*, and Alexander Mackay, *Dundee*.

The following members of the Society were elected to fill vacancies on the Council, viz.:—Dr. John Gunn, J. R. Middleton, J. Patten MacDougall, Dr. Maurice Paterson, The Earl of Dalkeith, M.P., the Rev. James Buchanan, Hugh Brown, *Glasgow*, and Victor Fraenkl, *Dundee*.

The Chairmen of the Society's Branches were re-elected.

Mr. William C. Smith, K.C., M.A., was appointed Honorary Treasurer in room of Mr. J. R. Reid, C.I.E. who resigned. Mr. J. R. Reid, C.I.E., and Mr. F. Grant Ogilvie, B.Sc., were appointed additional Trustees. Colonel James Sconce was appointed Honorary Map Curator in room of Mr. F. Bosse who had resigned.

Certain additions to the Local Branch Committees were approved.

The meeting then terminated.

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